



Corrective Action Framework

Marcus Hook Industrial Complex

EPA ID No. PAD980550594

Marcus Hook, Pennsylvania

Claymont, Delaware



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Corrective Action Framework

This Corrective Action Framework (CAF) is designed to memorialize a mutual understanding between Region III of the Environmental Protection Agency (EPA) and Marcus Hook Refinery Operations, a series of Evergreen Resources Group, LLC (Evergreen) to complete the Corrective Action (CA) obligations for the former Sunoco Inc. (R&M) (Sunoco) Marcus Hook Refinery located at 100 Green Street, Marcus Hook, PA 19061 (Property).

Evergreen assumed any liabilities of Sunoco arising from the environmental condition at the Property existing or occurring prior to December 30, 2013. As part of the sale of the Property, Sunoco Partners Marketing & Terminals L.P. (SPMT) agreed to be responsible for liabilities which are caused by or arise out of the ownership or operation of the Property after April 1, 2013. SPMT is currently operating under a RCRA Part B permit with Corrective Action obligations to the EPA. This CAF is based on information exchanged by EPA and Sunoco\Evergreen through multiple meetings between 2013 and 2016.

EPA and Evergreen anticipate that the goals described in this framework will allow both EPA and Evergreen to expedite the RCRA Facility Investigation (RFI) and the RFI approval. A more efficient and more focused RFI is expected to lead to an earlier remedy selection and implementation, and improve overall efficiency of the CA process at the Property. Implementation of the CA program in this streamlined manner is being formally referred to by the EPA as the "LEAN Process." EPA and Evergreen will use the RFI results to determine if selection and construction of a protective and cost-effective remedy is required.

The CAF is a tool intended to summarize the goals and expectations of the EPA and Evergreen that will facilitate the CA process at the Property. This CAF does not in any way alter EPA's authority or Evergreen's rights, defenses or obligations under federal law. The CAF is not a legally binding document and does not alter any legal requirements under any permit or order applicable to the facility. Nor is the CAF a substitute for a permit or order. Only where the CAF is expressly incorporated into a new permit (or order, for interim status facilities) or incorporated through a modification to an existing permit (or order for interim status facilities) will the CAF become an enforceable condition of the permit (or order for interim status facilities.) The CAF is also not expected to address every technical or administrative aspect or detail of the RFI. Rather, the CAF describes the discussions that took place during the CAF meeting or any subsequent meetings (e.g., escalation to management for resolution of differences to avoid delay). The CAF also documents material exchanged during the CAF meetings which are necessary for the CA process to efficiently commence. Note that this CAF is a "living document" and is subject to change upon agreement by the parties in light of new information or data.

I. CAF Meeting Participants

EPA Region 3 – Paul Gotthold, Kevin Bilash; PADEP SERO – David Brown; Evergreen – Jim Oppenheim, Fiona Livingston, Tiffany Doer; GHD – Colleen Costello, and other technical team members from GHD.

II. Site Characterization

A. Overview of facility/surrounding properties

The Property was a refinery with oil storage from approximately 1902 until it was idled and ceased operations in September 2012. Currently, the Property is known as the "Marcus Hook Industrial Complex" or "MHIC" and is used for petroleum liquids, ethane, butane and propane storage and



gas processing. Under the current Site Wide Approach Work Plan ("SWAWP") dated December 19, 2011 (Work Plan), the Property was divided into eight Areas of Interest ("AOIs") based on operational areas and other factors. Predominantly, the Property is located on approximately 590 acres along the Delaware River in Marcus Hook, Pennsylvania, but a small portion of the southwest corner of the Property is located in the State of Delaware. The Delaware portion of the Property is designated as AOI 7 and is located on approximately 44 acres. The Property is bordered by industrial, commercial, and residential properties, and the Delaware River. In this CAF, the term facility or Property is used to be consistent with the MHIC as defined above; however, the term 'site' is also used in a manner consistent with environmental investigations (i.e., on-site sampling, site-specific goals).

B. Environmental Characteristics

Site geology consists of unconsolidated silts, sands, and clays overlying crystalline bedrock. The bedrock is approximately 40 feet below ground surface (ft. bgs), and is part of the Ardentown Granitic Suite. This crystalline bedrock occurs locally in a single area of Delaware County, near the Delaware border, immediately underlying the Property. Crystalline rocks generally have no porosity with little, if any, secondary porosity yielding poor water producing qualities. These rocks have been described to yield too little water for industrial or public water supply (USGS, 1996). Regionally, the crystalline rocks underlie unconsolidated Coastal Plain sediments, which have been further described to serve primarily as a lower confining layer to retard movement of water of the overlying aquifers (Pennsylvania Geological Survey, 1961). As such, the crystalline rocks underlying the unconsolidated material at the Property are not considered to be a groundwater receptor. Therefore, the highest and best use for groundwater at the Property is as a recharge to surface water.

Other potential exposure pathways are expected to be minimal and will be better understood after the implementation of the AOI specific investigations. The intent is to address any completed exposure pathway that empirically demonstrates unacceptable exposure concentrations with expected remedies as part of the corrective action activities.

C. Areas of Concern (AOCs)/Solid Waste Management Units (SWMUs) Descriptions

The following identifies the current AOCs and SWMUs for the facility. These SWMUs and AOCs will be systematically evaluated through the Remedial Investigation/RCRA Facility Investigation process (RI/RFI).



SWMU ID	SWMU Name	AOI
SWMU NO. 1	Tank No. 1 -Receiving Tank (Solid Waste Facility)*	5
SWMU NO. 2	Tank No. 2 Receiving Tank (SWF)*	5
SWMU NO. 3	Tank No. 3 Receiving Tank (SWF)*	5
SWMU NO. 4	Tank No. 4 Sludge Storage Tank (SWF)*	5
SWMU NO. 5	Tank No. 5 Sludge Decant Tank (SWF)*	5
SWMU NO. 6	Tank No. 6 Collection and Transfer Tank (SWF)*	5
SWMU NO. 7	Tank No. 51 Mix Tank (SWF)*	5
SWMU NO. 8	Tank No. 52 Contact Tank (SWF)*	5
SWMU NO. 9	Tank No. 53a Surge Tank (SWF)*	5
SWMU NO. 10	Tank No. 53b Surge Tank (SWF)*	5
SWMU NO. 11	Tank No. 53c. Surge Tank (SWF)*	5
SWMU NO. 12	Tank No. 56 Filtrate Tank (SWF)*	5
SWMU NO. 13	Tank No. 50 Lime Slurry Tank (SWF)	5
SWMU NO. 14	Tank No. 54 Precoat Tank (SWF)	5
SWMU NO. 15	Tank No. 55 H.W. Wash Tank (SWF)	5
SWMU NO. 16	Tank No. 57 Equalizing Tank (SWF)	5
SWMU NO. 17	Catalyst Fines Silo	5
SWMU NO. 18	Lime, Spent Clay, and Catalyst Loading System	5
SWMU NO. 19	Sludge Receiving Trough (SWF)	5
SWMU NO. 20	Sludge Filter Press (SWF)	5
SWMU NO. 21	Filter Cake Knock-Out Area	5
SWMU NO. 22	Hazardous Waste Container Storage Pad*	5
SWMU NO. 23	Old Sludge Basin	5/7
SWMU NO. 24	Old Decant Basin	5/7
SWMU NO. 25	Old 12 Plant Sludge Basin	2
SWMU NO. 26	Old 18 Plant Sludge Basin	6
SWMU NO. 27	Phillips Island Area	5/7
SWMU NO. 28	Phillips Island Maintenance Storage Area	5
SWMU NO. 29	Phillips Island Roll-Off Storage Area	5
SWMU NO. 30	Phillips Island Old Drum Storage/Small Roll-Off Area	5
SWMU NO. 31	Fire Fighter Training Area	5
SWMU NO. 32	Impoundment Tank No. T-101	5
SWMU NO. 33	Phillips Island Surface Drainage Ditches	5
SWMU NO. 34	Phillips Island Sand Blasting Area	5
SWMU NO. 35-39	10-4 Plant Catalyst Fines Collection Roll-Offs	1
SWMU NO. 40	10-4 Plant Roll-Off Storage Area	1
SWMU NO. 41	10-4 Plant Spent Catalyst Silo	1
SWMU NO. 42	10-4 Plant Electrostatic Precipitators	1



SWMU ID	SWMU Name	AOI
SWMU NO. 43	10-4 Plant Sour Water Stripper	1
SWMU NO. 44	10-4 Plant Catalyst Regeneration Unit	1
SWMU NO. 45	Garage High Pressure Wash Area	5
SWMU NO. 46	Garage Aboveground Waste Oil Tank	5
SWMU NO. 47	Mechanical Shop Saw Dust Collector	5
SWMU NO. 48	Mechanical Shop Sand Blast Unit	5
SWMU NO. 49	Mechanical Shop Wire Spray Unit	5
SWMU NO. 50	Mechanical Shop Equipment Wash Rack	5
SWMU NO. 51	Dock No. 2 Recovery Well System	6
SWMU NO. 52	Laboratory Waste Accumulation Building	3
SWMU NO. 53	8-C Crude Unit Drip Showers	3
SWMU NO. 54	B & P Warehouse Drum Loading Area	6
SWMU NO. 55	Benzene Vapor Recovery System	5
SWMU NO. 56	Asphalt Plant Area	5
SWMU NO. 57	Clay Contact Plant Area	3
SWMU NO. 58	Slop Oil Tank V-29	3
SWMU NO. 59	Slop Oil Tank 132	3
SWMU NO. 60	Slop Oil Tank 388	5
SWMU NO. 61	Ballast Water Tank W-12	3
SWMU NO. 62	Heat Exchanger Bundle Cleaning Area	5
SWMU NO. 63	1A Oil/Water Separator	4
SWMU NO. 64	1B Oil/Water Separator	NA
SWMU NO. 65	1C Oil/Water Separator	5
SWMU NO. 66	1D Oil/Water Separator	5
SWMU NO. 67	1E Oil Water Separator	NA
SWMU NO. 68	1F Oil/Water Separator	5
SWMU NO. 69	1F Oil/Water Separator Feed Trench	5
SWMU NO. 70 -79	9 and 14 Oil/Water Separators	6
SWMU NO. 80.	Discharge Pipe and Excavation at 9 and 14 Oil/Water	6
SWMU NO. 81, 82	10 Oil/Water Separators	4
SWMU NO. 83	12A Oil/Water Separators	2
SWMU NO. 84-86	16 Oil/Water Separators	6
SWMU NO. 87-94	15 Oil/Water Separators	5
SWMU NO. 95	Combined Process/Storm Sewer System	Varied
SWMU NO. 96	Middle Creek Surface Drainage System	4,5,7
SWMU NO. 99	Rail Car Loading/Unloading Areas and Associated Tracks	Varied



SWMU ID	SWMU Name	AOI
SWMU NO. 100	Used Oil Accumulation Areas	Varied
AOC A	Stained Refinery Areas	Varied
AOC B	Underground Transfer Lines	Varied
AOC C	Underground Storage Tank Excavation Areas	Varied
AOC D	Underground Storage Tanks	5,6
AOC E	Underground Storage Caverns	4,5
AOC F	8-C Plant PCB Transformer Area	3
AOC G	1F Oil/Water Separator Electrical Box	5
AOC H	Kerosene Contamination Area	6

Notes:

1. SWMU = Solid Waste Management Unit
2. AOC = Area of Concern
3. ** = RCRA-Regulated Unit
4. Source of List = Phase II Final RCRA Facility Assessment, of the Sun Refining and Marketing Company Marcus Hook Refinery, Marcus Hook, PA, prepared by A.T. Kearney, Inc., dated August 19, 1991

D. Previous Releases

Evergreen is investigating all releases which have been reported to the PADEP or DNREC during the applicable timeframes. A list of these releases will be included in the Remedial Investigation reports and the RFI, as applicable. Several interim remedial systems have been installed due to the observation of Light Non Aqueous Phase Liquid (LNAPL) or due to vapor intrusion concerns. The interim measure and final measures systems are listed below.

Interim Measures

- Current LNAPL Control systems
 - The Green Street System is located in AOI 3. This LNAPL recovery system along Green Street consists of an interceptor trench and LNAPL skimming system. This system was restarted in 2011 due to the re-occurrence of LNAPL.
 - The Lab Building System is located in AOI 3. The Lab Building system recovers LNAPL and groundwater separately. This system was installed in 2001 due to the presence of LNAPL in the vicinity of the Lab Building. This system has since been incorporated into the Main Office Building system.
 - The Main Office Building System is located in AOI 3. The Main Office Building system recovers groundwater, LNAPL and soil vapor from wells around the Main Office Building. This system has incorporated the recovery wells from the Lab Building system. The system was completed in 2016.
- Current GW Control systems
 - The Post Road System is located in AOI 4. This system is a total fluids recovery system which was installed in 2002 due to the occurrence of LNAPL at the down-gradient boundary. An SVE system was installed as part of the total fluids recovery system to enhance LNAPL recovery and alleviate hydrocarbon vapors in utility manholes along Post



Road. The Post Road system includes recovery wells/soil vapor extraction points along Post Road and around the H5 Control Room.

- The 12 Tank System is located in AOI 4. The 12 Tank System consists of a total fluids recovery system installed in AOI 4 due to the occurrence of LNAPL. The system was installed in 2002. An SVE system was installed as part of the total fluids recovery system to enhance LNAPL recovery and alleviate hydrocarbon vapors in utility manholes along Post Road.
 - The Bulkhead System is located in AOI 6. The Bulkhead System is located along the Delaware River between the No. 2 and No. 3 Docks. The system was installed due to the presence of LNAPL along the Delaware River in 2013.
 - The Middle Creek System is located in AOI 5. The Middle Creek Remediation System consists of two groundwater interceptor trenches (Trench A and Trench B) installed in the area between the API Separator and Middle Creek. Total fluids are pumped from recovery wells directly to the API Separator. The system was started in the beginning of June 2009 due to the occurrence of LNAPL along Middle Creek.
- Current VI Control systems
 - The H5 Control Room is located in AOI 4. In addition to the soil vent system incorporated into the total fluids recovery system around the H5 Control Room, a sub floor vent system is operational due to odors in the H5 Control Room.
 - Other Interim Measures
 - Two basins located to the north of Middle Creek in AOI 5/7 are SWMU 23 (Old Sludge Basin) and SWMU 24 (Old Decant Basin). These basins have been stabilized through the addition of fly ash and chemical treatment as part of interim measures.

Final Measures

- The Final Measures for Middle Creek are located in AOI 5. The Middle Creek Drainage System (SWMU No. 96) was closed under RCRA in 1995. Post Closure sampling is currently being performed in select wells.
- The Final Measures for Phillips Island (SWMUs 27-31, 33, and 34) are located in AOI 5. The Phillips Island system consists of several remediation systems, the Phillips Island Recovery System, the East Wall System, the West Wall System, and the Delaware Seep System. The Phillips Island system was installed in 2006 due to the presence of LNAPL along the Delaware River. As part of an Act 2 closure in 1995, in addition to hydraulic control west of the Delaware River, vapor mitigation measures and surface drainage measures were implemented. An Act 2 Release of Liability was granted from PADEP.

E. RCRA Regulatory History

Evergreen has corrective action obligations under the RCRA program for the facility. In order to address the RCRA obligations, Sunoco submitted a Pennsylvania Act 2 Notice of Intent to Remediate (NIR) for the Property to the Pennsylvania Department of Environmental Protection (PADEP) on September 15, 2011. A revision to the NIR was submitted on January 15, 2015 to include AOI 8 in the NIR, a subsequent revision to the NIR was submitted on March 31, 2016 to exclude AOI 8 from the NIR. Both AOI 7 and AOI 8 will be addressed separately under RCRA.



Submittal of the NIR formally entered the Pennsylvania portions of the facility into the Pennsylvania Act 2 Program and acknowledged Sunoco's intent to enter the facility into the One Cleanup Program. The facility was officially entered into the One Cleanup Program in November 2011. Therefore, Act 2 remedial investigation reports will be submitted rather than RFIs for AOIs 1 through 6. A RFI will be submitted for the Delaware portion of the Property (AOI 7) and for AOI 8 in Pennsylvania.

Middle Creek was used as a wastewater conveyance and was closed under a closure plan approved by the PADEP in 1995. The unit is subject to post closure requirements under this approved plan that includes inspection, maintenance, and groundwater monitoring.

Phillips Island was used as a landfill, storing stormwater and wastewater, an empty drum storage area, a roll-off transfer station, fire training station, electrical substation, sandblasting/painting area, and a pump station. The PECO energy substation was constructed in 1996. Sunoco performed a site characterization, remedial investigation and risk assessment and developed a Cleanup Plan for the Phillips Island site and was granted a Release of Liability under Act 2 for this portion of the Property in 2005. Remedial components of the Act 2 closure included installation of vapor intrusion mitigation systems, recovery wells and paving. Sunoco and Florida Power and Light constructed a co-generation station on a portion of Phillips Island in 2004.

F. Other permitted activities

Stormwater discharged to Middle Creek and the Delaware River is managed under the authority of NPDES permits No. DE 0050288, effective May 1, 2010 and No. PA0011096 A1, effective August 1, 2005.

G. Access or physical constraints

SPMT is demolishing some on-site structures in order to build new storage tanks and related structures. Evergreen is scheduling the investigation activities in consideration of the ongoing demolition and construction activities. Remedial investigation activities are being completed if possible before these structures are built since investigation activities will not be possible beneath these structures after construction.

H. Other potential areas of investigation

As mentioned above, Evergreen is investigating all areas that were reported to the PADEP or DNREC during the relevant timeframe. In addition, any areas identified during tank closure activities are being considered during the investigation activities, but open tank incidents will be closed separately under the Pennsylvania and Delaware Tank Programs. Areas in the vicinity of the interim and final remedial systems are also being considered during the investigation activities.

III. Conceptual Site Model

The following sections describe Evergreen's Conceptual Site Model (CSM). The CSM is based on information currently available for the Property and immediately surrounding areas. This information may be updated based on new data or information that is generated during the investigation.



A. Sources and extent of known contamination

Sources of contamination could include ASTs, historic landfilling, Middle Creek Surface Drainage System and/or Plant operations. The figures attached to the CAF include:

Figures

- Figure 1, Site Plan and Areas of Interest
- Figure 2, Groundwater contours, October 2015
- Figure 3, Extent of LNAPL and Remedial Systems, October 2015

Ongoing investigation activities (Act 2 remedial investigations, RFI activities and tank investigations) have been conducted throughout the Areas of Interest. Data collected during the RI and RFI activities will be submitted to the EPA and PADEP in RI or RFI reports.

The contaminants of concern for the facility include: Lead (total and dissolved), 1,2-Dichloroethane, 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene, Benzene, Cumene, Ethylbenzene, Ethylene dibromide, Methyl tertiary butyl ether, Toluene, Xylenes, Anthracene, Benzo(a)anthracene, Benzo(g,h,i)perylene, Benzo(a)pyrene, Benzo(b)fluoranthene, Chrysene, Fluorene, Naphthalene, Phenanthrene, Pyrene. Other compounds will be added, as necessary, based on AOI specific considerations.

B. Contamination transport/migration pathways

Contaminant transport and migration pathways include hydrocarbon migration through the subsurface to groundwater, groundwater to surface water (Middle Creek and Delaware River) and hydrocarbon vapor intrusion potential. As discussed above, the crystalline bedrock underlying the unconsolidated material at the Property is not considered to be a groundwater receptor.

C. Tentative exposure receptors, exposure pathways, exposure routes

The following are the exposure pathways that are being evaluated for the Property:

Exposure Receptors - Office worker, industrial worker and construction worker

Exposure Point and Exposure Medium - surface soil, subsurface soil, groundwater, surface water, sediment and indoor air

Exposure Routes - dermal, inhalation, and incidental ingestion

D. Discussion of unknowns and uncertainty

Historical data and site knowledge are being used to design a biased sampling plan for the Property.

IV. RFI Work Plan

The USEPA and Evergreen agreed that a detailed work plan was not necessary, rather streamlined work plans would be submitted for each AOI investigations. Remedial investigations will be completed in accordance with the Act 2 program for the portion of the facility within Pennsylvania and a RFI will be completed for AOI 7 and AOI 8. The key elements of these investigations are summarized below.



V. RFI

The USEPA and Evergreen agreed that the following elements would be included in the RFI investigation approach and documented in the RFI Reports.

A. Background

Middle Creek surface water and sediment, as well as soils and groundwater in AOI 7, may be impacted by off-site groundwater, historical overland flow, sediment transport or historic operations from the adjacent Delaware Valley Works (DVW) which is the former Honeywell and General Chemical Site. Pesticide constituents (e.g., DDT and BHC isomers) have been identified in soil, groundwater, surface water and sediment of the Marcus Hook Industrial Complex; these constituents were not used or stored at the Property. Data from the off-site locations will be reviewed to determine how off-site impacts will be incorporated into the RFI. Consequently, pesticide constituents will be included in screening of the data collected in AOI 7 but will not have corrective action objectives since they are due to off-site impacts.

B. Screening levels

The EPA, PADEP, and DNREC Criteria/Screening Levels being used in the investigation activities are summarized in the tables included in the CAF.

1. Soil Screening levels - The selection of the appropriate soil screening levels is described below and the soil screening levels are included in Table 1a.
 - a. **AOI 1 through AOI 6** – These AOI investigations are being completed in accordance with the PADEP Act 2 Program. Soil results will be first screened against the PADEP non-residential, used aquifer (total dissolved solids [TDS] <2,500 micrograms per liter [$\mu\text{g/l}$]) medium specific concentrations (MSCs) developed by the PADEP to implement the Statewide Health Standard (SHS). The following process will be used to select the soil SHS for each COC:
 - The highest value of either 100 times the groundwater MSC or the generic value MSC will be selected to represent the soil to groundwater numeric value.
 - The selected used aquifer, non-residential soil to groundwater numeric value will then be compared with the non-residential direct contact value (0 to 2 feet or 2 to 15 ft. bgs, as applicable).
 - The more stringent of the soil to groundwater value and the direct contact value will be selected as the soil MSC, otherwise referred to as the SHS, for initial comparison of soil sample results.

The SHS value is usually driven by the soil-to-groundwater MSC, and the soil-to-groundwater pathway will be addressed through the groundwater pathway. In order to further evaluate the risk posed by the concentrations of COCs which are detected above their respective SHS, the next step will be to compare all of the soil analytical results to the non-residential direct contact MSCs. Soil sample locations that exceed the non-residential direct contact MSCs will require further evaluation or require corrective action in order to attain a standard under Act 2.



An exception to this soil screening process exists for lead. On February 24, 2015, Evergreen submitted a Human Health Risk Assessment Report to PADEP which presented the development of a risk-based site-specific standard (SSS) for lead in soil. In a letter dated May 6, 2015, PADEP approved the report, and a non-residential direct contact site-specific numerical standard for lead of 2,240 mg/kg was established. This SSS is used in place of the default 0 to 2 ft. bgs direct contact standard for lead.

- b. **AOI 7 and AOI 8** –These AOI investigations will be completed following the RCRA process. The soil screening values for these AOIs are the USEPA's May 2016 Industrial/Commercial Regional Screening Levels (USEPA, 2016c&d). The USEPA RSLs criteria assume incidental soil ingestion, dermal contact with soil, and inhalation of vapors or particulates from exposed soil and are appropriate based on current and reasonably expected future land use at the site. The generic risk-based criteria used for screening were calculated based on cancer risk of 10^{-6} and a hazard quotient (HQ) of 0.1 and 1.
2. Groundwater Screening levels - The selected groundwater screening criteria are designed to be protective of potential exposures via drinking water use and represent highly conservative screening criteria for evaluating groundwater that is not a current or reasonably expected future drinking water supply at the facility. The selection of the appropriate groundwater screening levels is described below and the groundwater screening levels are included in Table 1b.
 - a. **AOI 1 through AOI 6** - These AOI investigations are being completed in accordance with the PADEP Act 2 Program. Groundwater sample analytical results will be screened against the PADEP MSCs for non-residential properties overlying used aquifers with TDS less than or equal to 2,500 µg/l (SHS). Where constituent concentrations are above the SHS, Evergreen will evaluate application of the site-specific remediation standard using the pathway elimination option, risk assessment or remediation.
 - b. **AOI 7 and AOI 8** - These AOI investigations will be completed following the RCRA process. The groundwater screening values will be the MCLs. For groundwater discharging from AOI 7 or AOI 8 to portions of the Property located in Pennsylvania the PADEP non-residential medium specific criteria (MSC) will be the groundwater screening values at the AOI boundary. These groundwater screening criteria are designed to be protective of potential exposures via drinking water use and represent highly conservative screening criteria for evaluating groundwater that is not a current or reasonably expected future drinking water supply at the facility.
 - c. **AOI 1 through AOI 8** - The CAOs for groundwater discharging to the Delaware River are based on not causing an exceedance of the Delaware River Basin Commission (DRBC) Surface Water Criteria, as presented in V.B.3. below.
3. Surface Water Screening levels
Surface water quality in the Delaware River and its tributaries is regulated by the Delaware River Basin Commission (DRBC). DRBC has published Water Quality Regulations (DRBC, 2013), which include concentrations protective of human health for surface water and fish



ingestion. There is no surface water consumption in the river near the facility, therefore, the DRBC fish consumption criteria were used as the screening levels for surface water. Where values were not available based on fish ingestion, DRBC criteria for protection of freshwater aquatic life (chronic exposures) were used for the surface water screening levels.

The surface water screening levels are included in Table 1c.

4. Sediment Screening levels

No human contact exposure scenario applies to sediments in Middle Creek from industrial activity at the facility. There are however potential ecological exposures to sediments in Middle Creek, therefore the sediment screening values for Middle Creek are the Region 3 generic freshwater sediment criteria from the USEPA Biological Technical Assistance Group (BTAG) (USEPA, 2006).

The sediment screening levels are included in Table 1d.

5. Indoor Air Screening Levels - The selection of the appropriate indoor air screening levels is described below and the indoor air screening levels are included in Table 1e.

- a. **AOI 1 through AOI 6** – These AOI investigations are being completed in accordance with the PADEP Act 2 Program. The indoor air screening levels include the PADEP Indoor Air Statewide Health Standard (IASHS) Vapor Intrusion Screening Levels for Non-Residential (VISL-NR) exposures and Occupational exposure standards (OSHA PEL or NIOSH REL) in accordance with the PADEP Vapor Intrusion Guidance (January 2017). In some instances, the EPA Regional Screening Levels (RSL) may also be used to evaluate indoor air in AOI 1 through AOI 6 in accordance with the PADEP Vapor Intrusion Guidance. Background indoor air concentrations will also be used as a point of reference for evaluating both ambient and indoor air results.
- b. **AOI 7 and AOI 8** - These AOI investigations will be completed following the RCRA process. The indoor air screening levels will include the EPA Regional Screening Levels (RSL) and occupational exposure standards (OSHA PEL or NIOSH REL). Background indoor air concentrations will also be used as a point of reference for evaluating both ambient and indoor air results.

C. Corrective Action Objectives

The Corrective Action Objectives (CAOs) for the specific environmental media at the Marcus Hook Industrial Complex, have been developed cooperatively with the EPA, and are the following:

1. Soil

EPA's Corrective Action Objectives for soil are:

- a. Eliminate any direct contact exposures to soils greater than the PADEP non-residential direct contact standard in AOI 1 through AOI 6 and EPAs Industrial RSL in AOI 7 and AOI 8 as listed in Table 2a. These values may be modified based on site-specific risk assessment activities.
- b. Prevent exposure to lead as listed in Table 2a.



- c. Prevent exposure to acid sludge waste to the extent practicable.
 - d. Mitigate exposures to LNAPL during intrusive activities by construction workers in the areas impacted by LNAPL.
 - e. Prevent future residential land use based on current and future use risk exposure scenarios.
2. Groundwater
- EPA's Corrective Action Objectives for groundwater are:
- a. Prevent inhalation (unless further evaluated and shown to be acceptable by a vapor intrusion assessment), ingestion or dermal exposure above non-residential standards listed in Table 1b.
 - b. Prohibit use of groundwater except for what is required for sampling and remediation.
 - c. Prevent offsite migration or discharge of LNAPL.
 - d. Prevent offsite migration of groundwater to the Delaware River at concentrations that would exceed the DRBC fish ingestion criteria as listed in Table 2b.
 - e. Prevent migration of groundwater to an off-site property, measured at the monitoring wells along the eastern and western property boundaries, at concentrations greater than the applicable PADEP non-residential standards in AOIs 1, 2, 3, 4, 5, and 8 listed in Table 2b.
 - f. Prevent groundwater that discharges to Middle Creek that would result in concentrations that would exceed the DRBC fish ingestion criteria in the Delaware River.
3. Surface Water
- EPA's Corrective Action Objectives for surface water are:
- a. Prevent any impacts to the Delaware River that cause surface water concentrations to exceed the DRBC fish ingestion criteria listed in Table 1c.
 - b. Prevent unacceptable ecological impacts to surface water in Middle Creek as determined by an ecological risk assessment.
4. Sediment
- EPA's Corrective Action Objective for sediment is:
- Prevent unacceptable ecological impacts to sediment in Middle Creek as determined by an ecological risk assessment.
5. Indoor Air
- EPA's Corrective Action Objectives for indoor air are:
- a. Comply with the OSHA Permissible Exposure Limits for industrial use where employees are regulated by OSHA as listed in Table 1e.



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- b. Prevent human exposure to non-OSHA regulated workers from the vapors generated from LNAPL or residual soil and groundwater contamination exceeding the applicable EPA nonresidential indoor air standards or the PADEP non-residential indoor air criteria, as listed in Table 1e.

D. Adaptive approach

Evergreen is adapting the site characterization schedule to SPMT's ongoing demolition activities. Therefore, some sequence of AOI investigations may be altered to adjust to SPMT's schedule.

E. Quality Assurance Project Plan (QAPP)

All data will be analyzed by a Pennsylvania or Delaware certified lab, as appropriate. All data will go through standard QA/QC, and 10 percent will go through reduced data validation.

F. Data quality objectives

The data will be collected and analyzed so that the data quality objectives of the PADEP's Act 2 and Tank Programs, DNREC's HSCA and Tank Programs and EPA's RCRA program will be achieved wherever practicable.

G. Modeling

The Johnson-Ettinger model may be used for Vapor Intrusion, the Quick Domenico model may be used for fate and transport modeling, and the CORMix model was used for groundwater to surface water mixing models. The CORMix model was used to develop the groundwater screening values summarized in Table 2b. Additional models may also be used during the investigation and assessment activities and will be discussed with the EPA, as appropriate.

H. Sampling approach/design

The sampling approach and design is following Act 2 and RCRA procedures to investigate the Property.

I. Sample analysis

The same COCs are to be analyzed in each environmental media, with the exception of vapor which will only be analyzed for volatiles, as listed above in Section IIIA. The list may be modified as needed based on AOI specific sampling information.

J. Use of historical data

Historical data will be used to develop the sampling plans for the remedial investigation activities. Historical data will not be used in any risk assessment evaluations.

K. Health and Safety Plan

A site-specific health and safety plan (HASP) has been prepared for the remediation program at the facility. This HASP is followed in conjunction with facility safety procedures including the facility work permit program. No work is performed within the facility without written authorization from facility personnel.



VI. Community involvement and environmental justice

Community involvement will be completed in accordance with the Act 2 and RCRA procedures. In addition, community involvement will be accomplished through existing initial notifications and periodic presentations to the Environmental Advisory Council, a coalition of local industry and local representatives who meet once per month to discuss the environmental conditions of the facility. This may be modified by agreement of EPA and Evergreen, if determined to be necessary. EPA will follow agency public involvement requirements as part of the remedy decision process.

VII. Work plan implementation schedule

All RI reports and the RFIs are planned to be submitted by second quarter of 2017. The Cleanup Plan and applicable Corrective Measures Studies (CMS) are planned to be submitted by the first quarter of 2018.

VIII. Interim Measures

The current Interim Measures (IMs) for the facility are described in Section IID above. If conditions are observed during the remedial investigation activities that require additional IMs or enhancements of the current IMs those activities will be completed.

IX. Goals and Expectations

During the CAF development meetings, the EPA and Sunoco/Evergreen identified the following critical decisions. Each critical decision and resolution, or agreed path toward future agreement, is summarized below.

- Land use/reasonably expected future land use is expected to remain industrial.
- Existing background conditions may be considered as part of the evaluation of the facility.
- Historical data will be used to design the remedial investigation activities.
- The highest beneficial use of groundwater is as a recharge to surface water. There are no other identified uses for groundwater.
- Evergreen will coordinate with the PADEP and DNREC tank programs and the PADEP Act 2 program, as required.
- The future use of the facility is expected to include products storage, propylene splitting, shale gas processing and gas storage/transfer.
- There are no toxicity/criteria changes currently expected but they will be addressed if they arise.
- There are no risk range issues expected currently but they will be addressed if they arise.
- One or more Environmental Covenant(s) will be sought for the site as part of remedy completion.

X. Other Potential Issues

A. Format for data/information exchange/submissions

The data will be submitted via Act 2 reports for AOI 1 through 6 located in Pennsylvania. The AOI 7 and the AOI 8 investigations will be submitted to the EPA in separate RFIs. A standalone ecological risk assessment was prepared for Middle Creek.



B. Interim submissions approaches

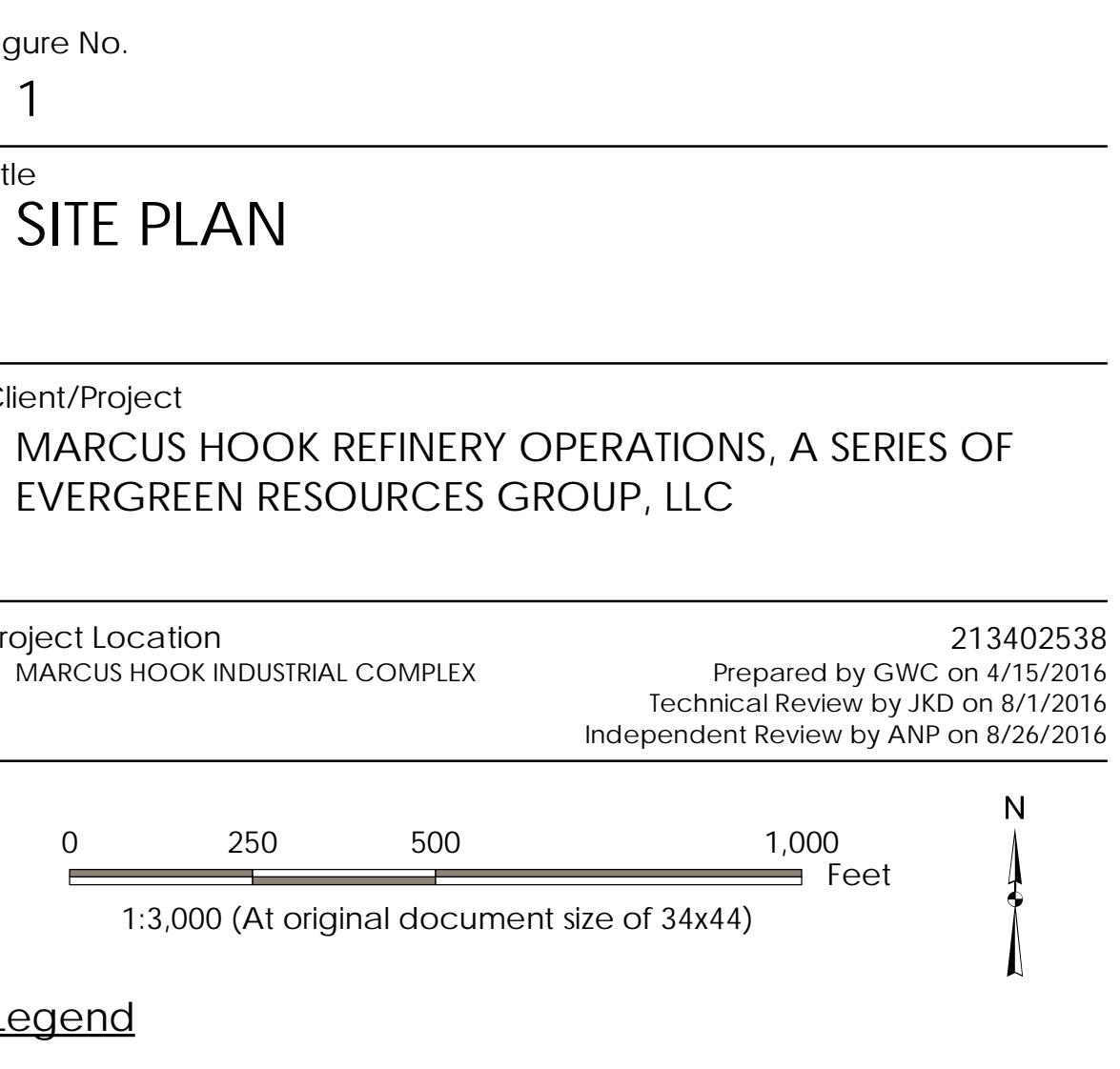
The purpose of the LEAN Process is to provide a streamlined mechanism for parties to voluntarily meet RCRA requirements. Therefore, interim submittals are purposely removed from the Work Plan. Instead, information exchanges and other types of correspondence will occur through email and meetings.

C. Schedule of deliverables (e.g., RFI work plan)

All remedial investigation reports for AOIs 1 through 6 and the RFIs for AOI 7 and 8 are planned to be submitted by second quarter of 2017. The Cleanup Plan for AOIs 1 through 6 is planned to be submitted by the first quarter of 2018. The CMS for AOI 7 and AOI 8 (if necessary) is expected to be submitted by first quarter 2018.

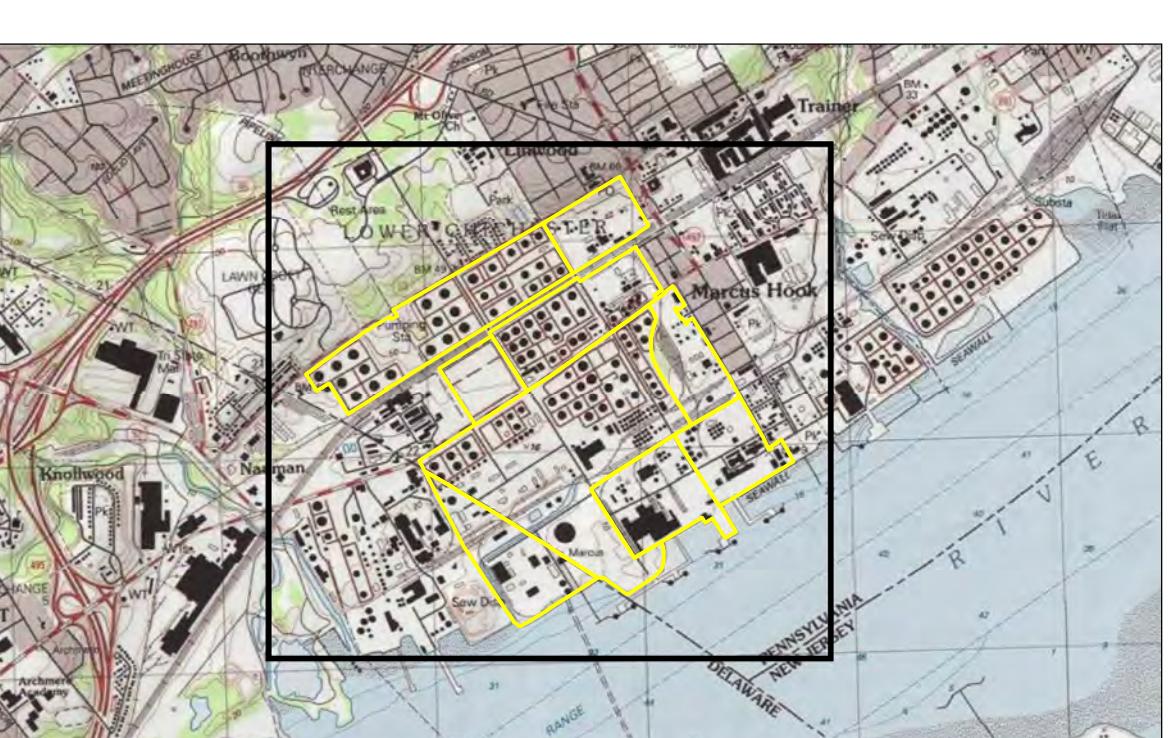
D. Risk Assessment

Evergreen will complete human health and ecological risk assessments as necessary to support the Corrective Action Process.



Legend

- MONITORING WELL
- RECOVERY WELL
- ☒ SUMP AND RECOVERY SUMP WELL
- ◆ DAMAGED WELL
- ✗ DESTROYED WELL
- ▲ UNABLE TO LOCATE WELL
- 1937 COASTLINE (APPROXIMATE)
- - - MIDDLE CREEK CONVEYANCE
- ACTIVE REMEDIATION SYSTEM
- 84" STORM SEWER (SUN REFINING AND MARKETING DRAWING 1-0-1/14017a)
- PENNSYLVANIA-DELAWARE STATE BORDER LINE
- AOI AND PROPERTY BOUNDARY
- PENNSYLVANIA MUNICIPALITY BOUNDARY



NOTES

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Figure No.
2
Title
GROUNDWATER ELEVATION CONTOUR MAP OCTOBER 2015

Client/Project
MARCUS HOOK REFINERY OPERATIONS, A SERIES OF EVERGREEN RESOURCES GROUP, LLC.

Project Location
MARCUS HOOK INDUSTRIAL COMPLEX
Prepared by GWC on 12/17/2015
Technical Review by ADK on 1/5/2016
Independent Review by JKD on 1/5/2016

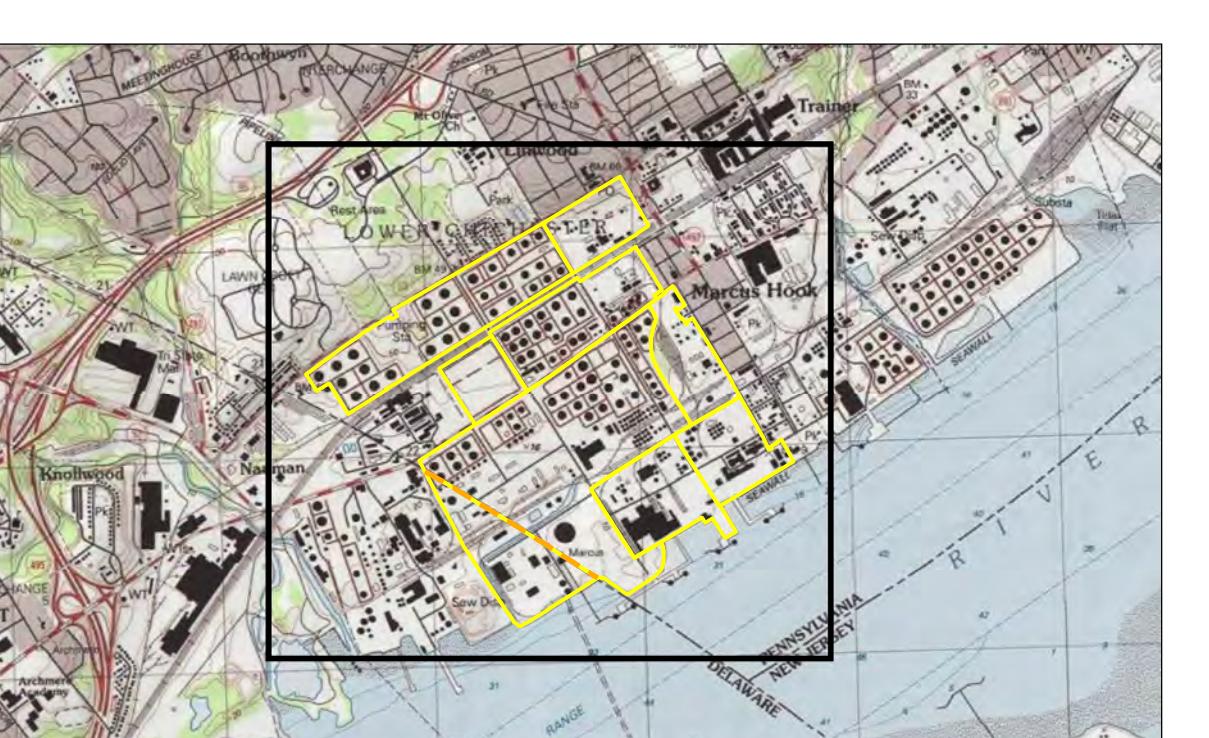
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1:3,000 (At original document size of 34x44)
Feet



Legend

- MONITORING WELL
- RECOVERY WELL
- ☒ SUMP AND RECOVERY SUMP WELL
- ◆ DAMAGED WELL
- ✗ DESTROYED WELL
- ▲ UNABLE TO LOCATE WELL
- - - 1937 COASTLINE (APPROXIMATE)
- REMEDIATION SYSTEM
- OCTOBER 2015 GROUNDWATER ELEVATION CONTOUR (FEET NORTH AMERICAN VERTICAL DATUM 1988 [FT NAVD 88])
- PENNSYLVANIA-DELAWARE STATE BOUNDARY LINE
- PENNSYLVANIA MUNICIPALITY BOUNDARY
- SITE AND AOI BOUNDARY
- 21.85 GROUNDWATER ELEVATION (FT NAVD88)
NOT MEASURED OR GROUNDWATER ELEVATION
- NM NOT CALCULATED DUE TO LACK OF SURVEYED REFERENCE ELEVATION
- MW-237 8.44 WELL NOT USED FOR GROUNDWATER CONTOURS

GAUGING DATA COLLECTED UNDER PUMPING CONDITIONS



NOTES
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2. Sources: Stantec
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Figure No.
3
Title
ESTIMATED LNAPL EXTENT

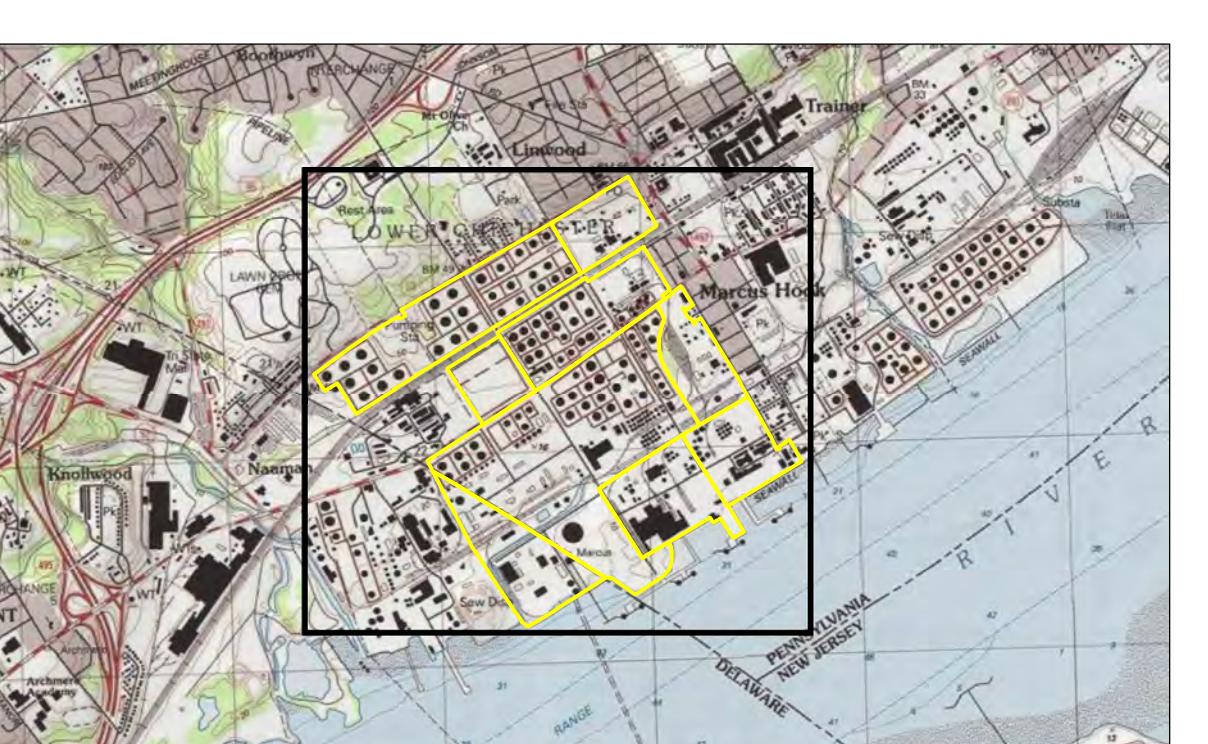
Client/Project
MARCUS HOOK REFINERY OPERATIONS, A SERIES OF EVERGREEN RESOURCES GROUP, LLC

Project Location
MARCUS HOOK INDUSTRIAL COMPLEX
Prepared by GWC on 10/10/2016
Technical Review by JKD on 10/27/2016
Independent Review by CM on 10/27/2016

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1:2,700 (At original document size of 34x44)
0 225 450 Feet
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Legend

- MONITORING WELL
- RECOVERY WELL
- ✖ SUMP AND RECOVERY SUMP WELL
- ◆ DAMAGED WELL
- ✗ DESTROYED WELL
- ▲ UNABLE TO LOCATE WELL
- ACTIVE REMEDIATION SYSTEM
84" STORM SEWER (SUN REFINING AND MARKETING DRAWING 1-0-1/14017a)
- PENNSYLVANIA DELAWARE STATE LINE
- AOI AND PROPERTY BOUNDARY
- PENNSYLVANIA MUNICIPALITY BOUNDARY
- ESTIMATED EXTENT OF LNAPL PLUME AREAS
GENERALIZED LNAPL TYPE
- LIGHT DISTILLATE
- MIXES OF LIGHT/MIDDLE DISTILLATE
- MIDDLE DISTILLATE
- HEAVY DISTILLATE
- NOT YET CHARACTERIZED



NOTES
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Table 1a

**Soil Screening Levele
Corrective Action Framework
Marcus Hook Industrial Complex**

Analyte	CAS No.	EPA Industrial RSLs ⁽¹⁾			PADEP Act 2 Medium Specific Concentrations Non-Residential Direct Contact (0-2 ft) ⁽²⁾ (mg/kg)		PADEP Act 2 Medium Specific Concentrations Non-Residential Direct Contact (2-15 ft) ⁽²⁾ (mg/kg)		PADEP Act 2 <2500 TDS, Used Aquifer, Non-Residential MCS2 Soil to GW Values			PADEP Act 2 Non-Residential MSC (0-2') (mg/kg)	PADEP Act 2 Non-Residential MSC (2-15') (mg/kg)
		Carcinogenic SL TR=1E-06 (mg/kg)	Noncarcinogenic SL THI=0.1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)	PADEP Act 2 Medium Specific Concentrations Non-Residential Direct Contact (0-2 ft) ⁽²⁾ (mg/kg)	PADEP Act 2 Medium Specific Concentrations Non-Residential Direct Contact (2-15 ft) ⁽²⁾ (mg/kg)	100 x GWMSC (mg/kg)	Generic Value (mg/kg)	PA Soil to GW MSC (mg/kg)	PADEP Act 2 Non-Residential MSC (0-2') (mg/kg)	PADEP Act 2 Non-Residential MSC (2-15') (mg/kg)		
Volatile Organic Compounds													
1,1,1-Trichloroethane	71-55-6	-	3600	36000	10000	10000	20	7.2	20	20	20	20	
1,1,2,2-Tetrachloroethane	79-34-5	2.7	2300	23000	38	44	0.43	0.13	0.43	0.43	0.43	0.43	
1,1,2-Trichloroethane	79-00-5	5	0.63	6.3	16	18	0.5	0.15	0.5	0.5	0.5	0.5	
1,1-Dichloroethane	75-34-3	16	23000	230000	1400	1600	16	3.9	16	16	16	16	
1,1-Dichloroethene	75-35-4	-	100	1000	10000	10000	0.7	0.19	0.7	0.7	0.7	0.7	
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	0.064	2.5	25	0.37	0.43	0.02	0.0092	0.02	0.02	0.02	0.02	
1,2-Dibromoethane (Ethylene dibromide)	106-93-4	0.16	33	330	3.7	4.3	0.005	0.0012	0.005	0.005	0.005	0.005	
1,2-Dichlorobenzene	95-50-1		930	9300	10000	10000	60	59	60	60	60	60	
1,2-Dichloroethane	107-06-2	2	14	140	86	98	0.5	0.1	0.5	0.5	0.5	0.5	
1,2-Dichloroethene	540-59-0	-	-	-	-	-	-	-	-	-	-	-	
1,2-Dichloropropane	78-87-5	4.4	6.6	66	220	260	0.5	0.11	0.5	0.5	0.5	0.5	
1,3-Dichlorobenzene	541-73-1	-	-	-	10000	10000	60	61	61	61	61	61	
1,3-Dichloropropene	542-75-6	8.2	31	310	560	640	3.4	0.61	3.4	3.4	3.4	3.4	
1,4-Dichlorobenzene	106-46-7	11	2500	25000	200	230	7.5	10	10	10	10	10	
1,4-Dioxane	123-91-1	24	450	4500	290	330	3.2	0.42	3.2	3.2	3.2	3.2	
2-Butanone (Methyl ethyl ketone) (MEK)	78-93-3	-	19000	190000	10000	10000	400	76	400	400	400	400	
2-Hexanone	591-78-6	-	130	1300	2400	2800	26	6.4	26	26	26	26	
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	108-10-1	-	14000	140000	10000	10000	930	140	930	930	930	930	
Acetone	67-64-1	-	67000	670000	10000	10000	10000	1200	10000	10000	10000	10000	
Acrolien	107-02-8	-	0.06	0.6	1.6	1.8	0.018	0.002	0.018	0.018	0.018	0.018	
Acrylonitrile	107-13-1	1.1	-	-	33	38	0.37	0.051	0.37	0.37	0.37	0.37	
Benzene	71-43-2	5.1	42	420	290	330	0.5	0.13	0.5	0.5	0.5	0.5	
Bromodichloromethane	75-27-4	1.3	2300	23000	60	69	8	2.7	8	8	8	8	
Bromoform	75-25-2	86	2300	23000	2000	2300	8	3.5	8	8	8	8	
Bromomethane (Methyl bromide)	74-83-9	-	3	30	400	460	1	0.54	1	1	1	1	
Carbon disulfide	75-15-0	-	350	3500	10000	10000	620	530	620	620	620	620	
Carbon tetrachloride	56-23-5	2.9	57	570	370	430	0.5	0.26	0.5	0.5	0.5	0.5	
Chlorobenzene	108-90-7	-	130	1300	4000	4600	10	6.1	10	10	10	10	
Chlorobromomethane	74-97-5	-	63	630	3200	3600	9	1.6	9	9	9	9	
Chloroethane	75-00-3	-	5700	57000	10000	10000	120	26	120	120	120	120	
Chloroform (Trichloromethane)	67-66-3	1.4	100	1000	97	110	8	2	8	8	8	8	
Chloromethane (Methyl chloride)	74-87-3	-	46	460	1200	1400	3	0.38	3	3	3	3	
cis-1,2-Dichloroethene	156-59-2	-	230	2300	6400	10000	7	1.6	7	7	7	7	
Cyclohexane	110-82-7	-	2700	27000	10000	10000	5300	6900	6900	6900	6900	6900	
Dibromochloromethane	124-48-1	39	2300	23000	82	95	8	2.5	8	8	8	8	
Dichlorodifluoromethane (CFC-12)	75-71-8	-	37	370	8000	9100	100	100	100	100	100	100	
Ethylbenzene	100-41-4	25	2000	20000	890	1000	70	46	70	70	70	70	
Isopropyl benzene	98-82-8	-	990	9900	10000	10000	350	2500	2500	2500	2500	2500	

Table 1a

Analyte	CAS No.	Soil Screening Levels Corrective Action Framework Marcus Hook Industrial Complex						Screening Criteria					
		EPA Industrial RSLs ⁽¹⁾			PADEP Act 2 Medium Specific Concentrations Non-Residential Direct Contact (0-2 ft) ⁽²⁾		PADEP Act 2 Medium Specific Concentrations Non-Residential Direct Contact (2-15 ft) ⁽²⁾		PADEP Act 2 <2500 TDS, Used Aquifer, Non-Residential MCS2 Soil to GW Values			PADEP Act 2 Non-Residential MSC (0-2') (mg/kg)	
		Carcinogenic SL TR=1E-06 (mg/kg)	Noncarcinogenic SL THI=0.1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)									
Volatile Organic Compounds (cont'd)													
m&p-Xylene	-	-	-	-	-	-	-	-	-	-	-	-	-
Methyl acetate	79-20-9	-	120000	1200000	10000	10000	10000	2200	10000	10000	10000	10000	10000
Methyl cyclohexane	108-87-2	-	-	-	-	-	-	-	-	-	-	-	-
Methyl tert butyl ether (MTBE)	1634-04-4	210	6400	64000	8600	9900	2	0.28	2	2	2	2	2
Methylene chloride	75-09-2	1000	320	3200	10000	10000	0.5	0.076	0.5	0.5	0.5	0.5	0.5
o-Xylene	95-47-6	-	280	2800	-	-	-	-	-	-	-	-	-
Styrene	100-42-5	-	3500	35000	10000	10000	10	24	24	24	24	24	24
Tetrachloroethene	127-18-4	100	39	390	3200	3600	0.5	0.43	0.5	0.5	0.5	0.5	0.5
Toluene	108-88-3	-	4700	47000	10000	10000	100	44	100	100	100	100	100
trans-1,2-Dichloroethene	156-60-5	-	2300	23000	4800	5500	10	2.3	10	10	10	10	10
Trichloroethene	79-01-6	6	1.9	19	160	180	0.5	0.17	0.5	0.5	0.5	0.5	0.5
Trichlorofluoromethane (CFC-11)	75-69-4	-	35000	350000	10000	10000	200	87	200	200	200	200	200
Trifluorotrichloroethane (CFC-113)	76-13-1	-	17000	170000	10000	10000	10000	10000	10000	10000	10000	10000	10000
Vinyl chloride	75-01-4	1.7	37	370	61	280	0.2	0.027	0.2	0.2	0.2	0.2	0.2
Xylenes (total)	1330-20-7	-	250	2500	8000	9100	1000	990	1000	1000	1000	1000	1000
Semivolatile Organic Compounds													
1,2,3-Trichlorobenzene	87-61-6	-	93	930	-	-	-	-	-	-	-	-	-
1,2,4,5-Tetrachlorobenzene	95-94-3	-	35	350	960	190000	3.5	16	16	16	16	16	16
1,2,4-Trichlorobenzene	120-82-1	110	-	-	3100	10000	7	27	27	27	27	27	27
1,2,4-Trimethylbenzene	95-63-6	-	24	240	560	640	6.2	35	35	35	35	35	35
1,2-Diphenylhydrazine	122-66-2	2.9	-	-	110	190000	0.43	0.76	210	210	210	210	210
1,3,5-Trimethylbenzene	108-67-8	-	1200	12000	10000	10000	120	210	210	210	210	210	210
2,2'-Oxybis(1-chloropropane) (bis(2-Chloroisopropyl) ether)	108-60-1	-	4700	47000	220	250	30	8	30	30	30	30	30
2,3,4,6-Tetrachlorophenol	58-90-2	-	2500	25000	96000	190000	350	5500	5500	5500	5500	5500	5500
2,4,5-Trichlorophenol	95-95-4	-	8200	82000	190000	190000	1200	7300	7300	7300	7300	7300	7300
2,4,6-Trichlorophenol	88-06-2	210	82	820	3200	190000	12	34	34	34	34	34	34
2,4-Dichlorophenol	120-83-2	-	250	2500	9600	190000	2	1	2	2	2	2	2
2,4-Dimethylphenol	105-67-9	-	1600	16000	10000	10000	230	100	230	230	230	230	230
2,4-Dinitrophenol	51-28-5	-	160	1600	6400	190000	23	2.6	23	23	23	23	23
2,4-Dinitrotoluene	121-14-2	7.4	160	1600	290	190000	1.1	0.26	1.1	1.1	1.1	1.1	1.1
2,6-Dinitrotoluene	606-20-2	1.5	25	250	61	190000	0.23	0.068	0.23	0.23	0.23	0.23	0.23
2-Chloroethylvinyl ether	110-75-8	-	-	-	-	-	-	-	-	-	-	-	-
2-Chloronaphthalene	91-58-7	-	6000	60000	190000	190000	930	20000	20000	20000	20000	20000	20000
2-Chlorophenol	95-57-8	-	580	5800	10000	10000	4	4.4	4.4	4.4	4.4	4.4	4.4
2-Methylnaphthalene	91-57-6	-	300	3000	13000	190000	47	1900	1900	1900	1900	1900	1900
2-Methylphenol	95-48-7	-	4100	41000	160000	190000	580	96	580	580	580	580	580
2-Nitroaniline	88-74-4	-	800	8000	32000	190000	120	21	120	120	120	120	120

Table 1a

**Soil Screening Level
Corrective Action Framework
Marcus Hook Industrial Complex**

Analyte	CAS No.	EPA Industrial RSLs ⁽¹⁾			PADEP Act 2 Medium Specific Concentrations Non-Residential Direct Contact (0-2 ft) ⁽²⁾ (mg/kg)		PADEP Act 2 Medium Specific Concentrations Non-Residential Direct Contact (2-15 ft) ⁽²⁾ (mg/kg)		PADEP Act 2 <2500 TDS, Used Aquifer, Non-Residential MCS2 Soil to GW Values			
		Carcinogenic SL TR=1E-06 (mg/kg)	Noncarcinogenic SL THI=0.1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)	PADEP Act 2 Medium Specific Concentrations Non-Residential Direct Contact (0-2 ft) ⁽²⁾ (mg/kg)	PADEP Act 2 Medium Specific Concentrations Non-Residential Direct Contact (2-15 ft) ⁽²⁾ (mg/kg)	100 x GWMSC (mg/kg)	Generic Value (mg/kg)	PA Soil to GW MSC (mg/kg)	PADEP Act 2 Non-Residential MSC (0-2') (mg/kg)	PADEP Act 2 Non-Residential MSC (2-15') (mg/kg)	
Semivolatile Organic Compounds (cont'd)												
2-Nitrophenol	88-75-5	-			26000	190000	93	19	93	93	93	93
2-Phenylbutane (sec-Butylbenzene)	135-98-8	-	12000	120000	10000	10000	1200	2800	2800	2800	2800	2800
3,3'-Dichlorobenzidine	91-94-1	5.1	-	-	200	190000	0.76	42	42	42	42	42
3-Nitroaniline	99-09-2	-	-	-	-	-	-	-	-	-	-	-
4-Bromophenyl phenyl ether	101-55-3	-	-	-	-	-	-	-	-	-	-	-
4,6-Dinitro-2-methylphenol	534-52-1	-	6.6	66	260	190000	0.93	0.7	0.93	0.93	0.93	0.93
4-Bromophenyl phenyl ether	101-55-3	-	-	-	-	-	-	-	-	-	-	-
4-Chloro-3-methylphenol	59-50-7	-	8200	82000	190000	190000	1200	2500	2500	2500	2500	2500
4-Chloroaniline	106-47-8	11	330	3300	460	190000	1.7	2.1	2.1	2.1	2.1	2.1
4-Chlorophenyl phenyl ether	7005-72-3	-	-	-	-	-	-	-	-	-	-	-
4-Methylphenol	106-44-5	-	8200	82000	16000	190000	58	14	58	58	58	58
4-Nitroaniline	100-01-6	110	330	3300	4600	190000	17	2.5	17	17	17	17
4-Nitrophenol	100-02-7	-	-	-	26000	190000	6	4.1	6	6	6	6
Acenaphthene	83-32-9	-	4500	45000	190000	190000	380	4700	4700	4700	4700	4700
Acenaphthylene	208-96-8	-	-	-	190000	190000	700	8000	8000	8000	8000	8000
Acetophenone	98-86-2	-	12000	120000	10000	10000	1200	640	1200	1200	1200	1200
Anthracene	120-12-7	-	23000	230000	190000	190000	6.6	350	350	350	350	350
Atrazine	1912-24-9	10	2900	29000	400	190000	0.3	0.13	0.3	0.3	0.3	0.3
Benzaldehyde	100-52-7	820	12000	120000	-	-	-	-	-	-	-	-
Benzidine	92-87-5	0.01	-	-	0.4	190000	0.0015	2	2	0.4	0.4	2
Benzo(a)anthracene	56-55-3	2.9	-	-	130	190000	0.49	430	430	130	130	430
Benzo(a)pyrene	50-32-8	0.29	-	-	12	190000	0.02	46	46	12	12	46
Benzo(b)fluoranthene	205-99-2	2.9	-	-	76	190000	0.12	170	170	76	76	170
Benzo(g,h,i)perylene	191-24-2	-	-	-	190000	190000	0.026	180	180	180	180	180
Benzo(k)fluoranthene	207-08-9	29	-	-	76	190000	0.055	610	610	76	76	610
Biphenyl (1,1-Biphenyl)	92-52-4	410	20	200	11000	190000	43	190	190	190	190	190
bis(2-Chloroethoxy)methane	111-91-1	-	250	2500	9600	10000	35	9.2	35	35	35	35
bis(2-Chloroethyl)ether	111-44-4	1	-	-	6.7	7.7	0.076	0.023	0.076	0.076	0.076	0.076
bis(2-Ethylhexyl)phthalate (DEHP)	117-81-7	160	1600	16000	6500	10000	0.6	130	130	130	130	130
Butyl benzylphthalate (BBP)	85-68-7	1200	16000	160000	10000	10000	180	10000	10000	10000	10000	10000
Caprolactam	105-60-2	-	40000	400000	-	-	-	-	-	-	-	-
Carbazole	86-74-8	-	-	-	4600	190000	17	110	110	110	110	110
Chrysene	218-01-9	290	-	-	760	190000	0.19	230	230	230	230	230
Dibenz(a,h)anthracene	53-70-3	0.29	-	-	22	190000	0.06	270	270	22	22	270
Dibenzofuran	132-64-9	-	100	1000	3200	190000	12	310	310	310	310	310
Diethyl phthalate	84-66-2	-	66000	660000	10000	10000	9300	2900	9300	9300	9300	9300
Dimethyl phthalate	131-11-3	-	-	-	-	-	-	-	-	-	-	-
Di-n-butylphthalate (DBP)	84-74-2	-	8200	82000	10000	10000	1200	4900	4900	4900	4900	4900

Table 1a

**Soil Screening Levels
Corrective Action Framework
Marcus Hook Industrial Complex**

Analyte	CAS No.	EPA Industrial RSLs ⁽¹⁾			PADEP Act 2 Medium Specific Concentrations Non-Residential Direct Contact (0-2 ft) ⁽²⁾ (mg/kg)		PADEP Act 2 Medium Specific Concentrations Non-Residential Direct Contact (2-15 ft) ⁽²⁾ (mg/kg)		PADEP Act 2 <2500 TDS, Used Aquifer, Non-Residential MCS2 Soil to GW Values			PADEP Act 2 Non-Residential MSC (0-2') (mg/kg)	PADEP Act 2 Non-Residential MSC (2-15') (mg/kg)
		Carcinogenic SL TR=1E-06 (mg/kg)	Noncarcinogenic SL THI=0.1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)					100 x GWMSC (mg/kg)	Generic Value (mg/kg)	PA Soil to GW MSC (mg/kg)		
Semivolatile Organic Compounds (cont'd)													
Di-n-octyl phthalate (DnOP)	117-84-0	-	820	8200	10000	10000	120	10000	10000	10000	10000	10000	10000
Fluoranthene	206-44-0	-	3000	30000	130000	190000	26	3200	3200	3200	3200	3200	3200
Fluorene	86-73-7	-	3000	30000	130000	190000	190	3800	3800	3800	3800	3800	3800
Hexachlorobenzene	118-74-1	0.96	93	930	57	190000	0.1	0.96	0.96	0.96	0.96	0.96	0.96
Hexachlorobutadiene	87-68-3	5.3	120	1200	1200	10000	4.4	52	52	52	52	52	52
Hexachlorocyclopentadiene	77-47-4	-	0.75	7.5	10000	10000	5	91	91	91	91	91	91
Hexachloroethane	67-72-1	8	46	460	220	260	0.1	0.56	0.56	0.56	0.56	0.56	0.56
Indeno(1,2,3-cd)pyrene	193-39-5	2.9	-	-	76	190000	0.28	22000	22000	76	22000	76	22000
Isophorone	78-59-1	2400	16000	160000	10000	10000	10	1.9	10	10	10	10	10
Naphthalene	91-20-3	17	59	590	760	190000	10	25	25	25	25	25	25
Nitrobenzene	98-95-3	22	130	1300	6400	10000	23	10	23	23	23	23	23
N-Nitrosodimethylamine	62-75-9	0.015	-	-	0.16	0.18	0.0018	0.00024	0.0018	0.0018	0.0018	0.0018	0.0018
N-Nitrosodi-n-propylamine	621-64-7	0.33	-	-	13	10000	0.049	0.0068	0.049	0.049	0.049	0.049	0.049
N-Nitrosodiphenylamine	86-30-6	470	-	-	19000	190000	69	110	110	110	110	110	110
Pentachlorophenol	87-86-5	4	280	2800	230	190000	0.1	5	5	5	5	5	5
Phenanthrene	85-01-8	-			190000	190000	110	10000	10000	10000	10000	10000	10000
Phenol	108-95-2	-	25000	250000	16000	18000	200	33	200	200	200	200	200
Pyrene	129-00-0	-	2300	23000	96000	190000	13	2200	2200	2200	2200	2200	2200
Pesticides													
4,4'-DDD	72-54-8	9.6	-	-	380	190000	1.4	150	150	150	150	150	150
4,4'-DDE	72-55-9	9.3	-	-	270	190000	1	220	220	220	220	220	220
4,4'-DDT	50-29-3	8.5	52	520	270	190000	0.55	330	330	330	330	330	330
Aldrin	309-00-2	0.18	3.5	35	5.4	190000	0.02	2.4	2.4	2.4	2.4	2.4	2.4
alpha-BHC	319-84-6	0.36	660	6600	14	190000	0.054	0.25	0.25	0.25	0.25	0.25	0.25
alpha-Chlordane	5103-71-9	-	-	-	-	-	-	-	-	-	-	-	-
beta-BHC	319-85-7	1.3	-	-	51	190000	0.19	1.1	1.1	1.1	1.1	1.1	1.1
Chlordane	57-74-9	7.7	-	-	260	190000	0.2	49	49	49	49	49	49
delta-BHC	319-86-8	7.7	-	-	-	-	-	-	-	-	-	-	-
Dieldrin	60-57-1	0.14	4.1	41	6	190000	0.021	0.58	0.58	0.58	0.58	0.58	0.58
Endosulfan I	959-98-8	-	-	-	19000	190000	50	260	260	260	260	260	260
Endosulfan II	33213-65-9	-	-	-	19000	190000	45	260	260	260	260	260	260
Endosulfan sulfate	1031-07-8	-	-	-	19000	190000	12	70	70	70	70	70	70
Endrin	72-20-8	-	25	250	960	190000	0.2	5.5	5.5	5.5	5.5	5.5	5.5
Endrin aldehyde	7421-93-4	-	-	-	-	-	-	-	-	-	-	-	-
Endrin ketone	53494-70-5	-	-	-	-	-	-	-	-	-	-	-	-
gamma-BHC (lindane)	58-89-9	2.5	30	300	83	190000	0.02	0.072	0.072	0.072	0.072	0.072	0.072
gamma-Chlordane	5103-74-2	-	-	-	-	-	0.2	49	49	49	49	49	49

Table 1a

**Soil Screening Levels
Corrective Action Framework
Marcus Hook Industrial Complex**

Analyte	CAS No.	EPA Industrial RSLs ⁽¹⁾			PADEP Act 2 Medium Specific Concentrations Non-Residential Direct Contact (0-2 ft) ⁽²⁾ (mg/kg)		PADEP Act 2 Medium Specific Concentrations Non-Residential Direct Contact (2-15 ft) ⁽²⁾ (mg/kg)		PADEP Act 2 <2500 TDS, Used Aquifer, Non-Residential MCS2 Soil to GW Values			PADEP Act 2 Non-Residential MSC (0-2') (mg/kg)	PADEP Act 2 Non-Residential MSC (2-15') (mg/kg)
		Carcinogenic SL TR=1E-06 (mg/kg)	Noncarcinogenic SL THI=0.1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)									
Pesticides (cont'd)													
Heptachlor	76-44-8	0.63	58	580	20	190000	0.04	0.68	0.68	0.68	0.68	0.68	0.68
Heptachlor epoxide	1024-57-3	0.33	1.5	15	10	190000	0.02	1.1	1.1	1.1	1.1	1.1	1.1
Methoxychlor	72-43-5	-	410	4100	16000	190000	4	630	630	630	630	630	630
Toxaphene	8001-35-2	2.1			83	190000	0.3	1.2	1.2	1.2	1.2	1.2	1.2
Polychlorinated Biphenyls													
Aroclor-1016 (PCB-1016)	12674-11-2	27	5.1	51	46	10000	0.17	47	47	46	46	47	47
Aroclor-1221 (PCB-1221)	11104-28-2	0.83	-	-	46	10000	0.17	0.83	0.83	0.83	0.83	0.83	0.83
Aroclor-1232 (PCB-1232)	11141-16-5	0.72	-	-	46	10000	0.17	0.7	0.7	0.7	0.7	0.7	0.7
Aroclor-1242 (PCB-1242)	53469-21-9	0.95	-	-	46	10000	0.17	20	20	20	20	20	20
Aroclor-1248 (PCB-1248)	12672-29-6	0.95	-	-	46	10000	0.17	81	81	46	46	81	81
Aroclor-1254 (PCB-1254)	11097-69-1	0.97	1.5	15	46	10000	0.17	340	340	46	46	340	340
Aroclor-1260 (PCB-1260)	11096-82-5	0.99			46	190000	0.17	770	770	46	46	770	770
Aroclor-1262 (PCB-1262)	37324-23-5	-	-	-	-	-	-	-	-	-	-	-	-
Aroclor-1268 (PCB-1268)	11100-14-4	-	-	-	-	-	-	-	-	-	-	-	-
Total PCBs	1336-36-3	0.94	-	-	-	-	-	-	-	-	-	-	-
Inorganics													
Aluminum	7429-90-5	-	110000	1100000	190000	190000	-	-	-	-	-	-	-
Antimony	7440-36-0	-	47	470	1300	190000	0.6	27	27	27	27	27	27
Arsenic	7440-38-2	3	48	480	61	190000	1	29	29	29	29	29	29
Barium	7440-39-3	-	22000	220000	190000	190000	200	8200	8200	8200	8200	8200	8200
Beryllium	7440-41-7	6900	230	2300	11	190000	0.4	320	320	320	320	11	11
Cadmium	7440-43-9	9300	98	980	6	190000	0.5	38	38	38	6.1	6.1	6.1
Calcium	7440-70-2	-	-	-	-	-	-	-	-	-	-	-	-
Chromium ⁽³⁾	7440-47-3	-	-	-	190000	190000	10	190000	190000	190000	190000	190000	190000
Cobalt	7440-48-4	1900	35	350	960	190000	3.5	160	160	160	160	160	160
Copper	7440-50-8	-	4700	47000	120000	190000	100	43000	43000	43000	43000	43000	43000
Cyanide (total)	57-12-5	-	15	150	1900	190000	20	200	200	200	200	200	200
Iron	7439-89-6	-	82000	820000	190000	190000	-	-	-	-	-	-	-
Lead ⁽⁴⁾	7439-92-1	-	2240	2240	2240	190,000/5995	0.5	450	450	450	450	450	450
Magnesium	7439-95-4	-	-	-	-	-	-	-	-	-	-	-	-
Manganese	7439-96-5	-	2600	26000	150000	190000	30	2000	2000	2000	2000	2000	2000
Mercury	7439-97-6	-	4.6	46	510	190000	0.2	10	10	10	10	10	10
Nickel	7440-02-0	64000	2200	22000	64000	190000	10	650	650	650	650	650	650
Potassium	7440-09-7	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	7782-49-2	-	580	5800	16000	190000	5	26	26	26	26	26	84
Silver	7440-22-4	-	580	5800	16000	190000	10	84	84	84	84	84	84

Table 1a

Analyte	CAS No.	Soil Screening Levels Corrective Action Framework Marcus Hook Industrial Complex						Screening Criteria					
		EPA Industrial RSLs ⁽¹⁾			PADEP Act 2 Medium Specific Concentrations Non-Residential Direct Contact (0-2 ft) ⁽²⁾			PADEP Act 2 Medium Specific Concentrations Non-Residential Direct Contact (2-15 ft) ⁽²⁾			PADEP Act 2 <2500 TDS, Used Aquifer, Non-Residential MCS2 Soil to GW Values		
		Carcinogenic SL TR=1E-06 (mg/kg)	Noncarcinogenic SL THI=0.1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)									
Inorganics (cont'd)													
Sodium	7440-23-5	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	7440-28-0	-	1.2	12	32	190000	-	-	-	-	-	-	-
Vanadium	7440-62-2	-	580	5800	220	190000	0.82	820	820	820	220	220	220
Zinc	7440-66-6	-	35000	350000	190000	190000	200	12000	12000	12000	1200	1200	1200

Notes:

- = no screening level available

(1) US EPA Regional Screening Levels – May 2016 - <https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-may-2016>

(2) PA Act 2 Medium Specific Concentrations – August 27, 2016.

<http://www.dep.pa.gov/Business/Land/LandRecycling/Standards-Guidance-Procedures/Pages/Statewide-Health-Standards.aspx>

(3) Denotes value for trivalent chromium.

(4) 2240 mg/kg for 0-2 ft. interval based on Site Specific Standard approved by the PADEP. 190,000 mg/kg in 2-16 mg/kg based on PADEP MSC. 5995 mg/kg in 2-15 foot interval based on USEPA blood lead model with construction worker exposure and default criteria.

Table 1b

Page 1 of 4

**Groundwater Screening Levels
Corrective Action Framework
Marcus Hook Industrial Complex**

Analyte	CAS No.	US EPA ⁽¹⁾	PADEP Act 2 <2500 TDS, Used Aquifer
		Maximum Contaminant Levels (µg/L)	Non-Residential MCS2 (µg/L)
Volatile Organic Compounds			
1,1,1-Trichloroethane	71-55-6	200	200
1,1,2,2-Tetrachloroethane	79-34-5	-	4.3
1,1,2-Trichloroethane	79-00-5	5	5
1,1-Dichloroethane	75-34-3	-	160
1,1-Dichloroethene	75-35-4	7	7
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	0.2	0.2
1,2-Dibromoethane (Ethylene dibromide)	106-93-4	0.05	0.05
1,2-Dichlorobenzene	95-50-1	600	600
1,2-Dichloroethane	107-06-2	5	5
1,2-Dichloroethene	540-59-0	-	-
1,2-Dichloropropane	78-87-5	5	5
1,3-Dichlorobenzene	541-73-1	-	600
1,3-Dichloropropene	542-75-6	-	34
1,3-Dichloropropene	542-75-6	-	34
1,4-Dichlorobenzene	106-46-7	75	75
2-Butanone (Methyl ethyl ketone) (MEK)	78-93-3	-	4000
2-Hexanone	591-78-6	-	260
2-Phenylbutane (sec-Butylbenzene)	135-98-8	-	12000
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	108-10-1	-	9300
Acetone	67-64-1	-	110000
Acrolein	107-02-8	-	0.18
Acrylonitrile	107-13-1	-	3.7
Benzene	71-43-2	5	5
Bromodichloromethane	75-27-4	80 [4]	80
Bromoform	75-25-2	80 [4]	80
Bromomethane (Methyl bromide)	74-83-9	-	10
Carbon disulfide	75-15-0	-	6200
Carbon tetrachloride	56-23-5	5	5
Chlorobenzene	108-90-7	100	100
Chloroethane	75-00-3	-	1200
Chloroform (Trichloromethane)	67-66-3	80 [4]	80
Chloromethane (Methyl chloride)	74-87-3	-	30
cis-1,2-Dichloroethene	156-59-2	70	70
cis-1,3-Dichloropropene	10061-01-5	-	-
Cyclohexane	110-82-7	-	53000
Dibromochloromethane	124-48-1	80 [4]	80
Dichlorodifluoromethane (CFC-12)	75-71-8	-	1000
Ethylbenzene	100-41-4	700	700
Hexane	110-54-3	-	6200
Isopropyl benzene	98-82-8	-	3500
m&p-Xylene	-	-	-
Methanol	67-56-1	-	35000
Methyl acetate	79-20-9	-	120000
Methyl cyclohexane	108-87-2	-	-
Methyl tert butyl ether (MTBE)	1634-04-4	-	20
Methylene chloride	75-09-2	5	5
o-Xylene	95-47-6	-	-
Styrene	100-42-5	100	100
tert-Butylbenzene	98-06-6	-	12000
Tetrachloroethene	127-18-4	5	5
Toluene	108-88-3	1000	1000
trans-1,2-Dichloroethene	156-60-5	100	100
trans-1,3-Dichloropropene	10061-02-6	-	-
Trichloroethene	79-01-6	5	5
Trichlorofluoromethane (CFC-11)	75-69-4	-	2000

Table 1b

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**Groundwater Screening Levels
Corrective Action Framework
Marcus Hook Industrial Complex**

Analyte	CAS No.	US EPA ⁽¹⁾	PADEP Act 2 <2500 TDS, Used Aquifer
		Maximum Contaminant Levels (µg/L)	Non-Residential MCS2 (µg/L)
Volatile Organic Compounds (cont'd)			
Trifluorotrichloroethane (CFC-113)	76-13-1	-	170000
Vinyl chloride	75-01-4	2	2
Xylenes (total)	1330-20-7	10000	10000
Semivolatile Organic Compounds			
1,2,3-Trichlorobenzene	87-61-6	-	-
1,2,4,5-Tetrachlorobenzene	95-94-3	-	35
1,2,4-Trichlorobenzene	120-82-1	70	70
1,2,4-Trimethylbenzene	95-63-6	-	62
1,2-Diphenylhydrazine	122-66-7	-	4.3
1,3,5-Trimethylbenzene	108-67-8	-	1200
2,2'-Oxybis(1-chloropropane) (bis(2-Chloroisopropyl) ether)	108-60-1	-	300
2,3,4,6-Tetrachlorophenol	58-90-2	-	3500
2,4,5-Trichlorophenol	95-95-4	-	12000
2,4,6-Trichlorophenol	88-06-2	-	120
2,4-Dichlorophenol	120-83-2	-	20
2,4-Dimethylphenol	105-67-9	-	2300
2,4-Dinitrophenol	51-28-5	-	230
2,4-Dinitrotoluene	121-14-2	-	11
2,6-Dinitrotoluene	606-20-2	-	2
2-Chloroethyl vinyl ether	110-75-8	-	-
2-Chloronaphthalene	91-58-7	-	9300
2-Chlorophenol	95-57-8	-	40
2-Methylnaphthalene	91-57-6	-	470
2-Methylphenol	95-48-7	-	5800
2-Nitroaniline	88-74-4	-	1200
2-Nitrophenol	88-75-5	-	930
3,3'-Dichlorobenzidine	91-94-1	-	7.6
3-Nitroaniline	99-09-2	-	-
4,6-Dinitro-2-methylphenol	534-52-1	-	9.3
4-Bromophenyl phenyl ether	101-55-3	-	-
4-Chloro-3-methylphenol	59-50-7	-	12000
4-Chloroaniline	106-47-8	-	17
4-Chlorophenyl phenyl ether	7005-72-3	-	-
4-Methylphenol	106-44-5	-	580
4-Nitroaniline	100-01-6	-	170
4-Nitrophenol	100-02-7	-	60
Acenaphthene	83-32-9	-	3800
Acenaphthylene	208-96-8	-	7000
Acetophenone	98-86-2	-	12000
Anthracene	120-12-7	-	66
Atrazine	1912-24-9	3	3
Benzaldehyde	100-52-7	-	-
Benzidine	92-87-5	-	0.015
Benzo(a)anthracene	56-55-3	-	4.9
Benzo(a)pyrene	50-32-8	0.2	0.2
Benzo(b)fluoranthene	205-99-2	-	1.2
Benzo(b)pyridine (Quinoline)	91-22-5	-	1.1
Benzo(g,h,i)perylene	191-24-2	-	0.26
Benzo(k)fluoranthene	207-08-9	-	0.55
Biphenyl (1,1-Biphenyl)	92-52-4	-	430
bis(2-Chloroethoxy)methane	111-91-1	-	350
bis(2-Chloroethyl)ether	111-44-4	-	0.76
bis(2-Ethylhexyl)phthalate (DEHP)	117-81-7	6	6
Butyl benzylphthalate (BBP)	85-68-7	-	1800

Table 1b

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**Groundwater Screening Levels
Corrective Action Framework
Marcus Hook Industrial Complex**

Analyte	CAS No.	US EPA ⁽¹⁾	PADEP Act 2 <2500 TDS, Used Aquifer	
		Maximum Contaminant Levels (µg/L)	Non-Residential MCS2 (µg/L)	
Semivolatile Organic Compounds (cont'd)				
Caprolactam	105-60-2	-	-	-
Carbazole	86-74-8	-	170	
Chrysene	218-01-9	-	1.9	
Dibenz(a,h)anthracene	53-70-3	-	0.6	
Dibenzofuran	132-64-9	-	120	
Diethyl phthalate	84-66-2	-	93000	
Dimethyl phthalate	131-11-3	-	-	
Di-n-butylphthalate (DBP)	84-74-2	-	12000	
Di-n-octyl phthalate (DnOP)	117-84-0	-	1200	
Fluoranthene	206-44-0	-	260	
Fluorene	86-73-7	-	1900	
Hexachlorobenzene	118-74-1	1	1	
Hexachlorobutadiene	87-68-3	-	44	
Hexachlorocyclopentadiene	77-47-4	50	50	
Hexachloroethane	67-72-1	-	1	
Indeno(1,2,3-cd)pyrene	193-39-5	-	2.8	
Isophorone	78-59-1	-	100	
Naphthalene	91-20-3	-	100	
Nitrobenzene	98-95-3	-	230	
N-Nitrosodimethylamine	62-75-9	-	0.018	
N-Nitrosodi-n-propylamine	621-64-7	-	0.49	
N-Nitrosodiphenylamine	86-30-6	-	690	
Pentachlorophenol	87-86-5	1	1	
Phenanthrene	85-01-8	-	1100	
Phenol	108-95-2	-	2000	
Pyrene	129-00-0	-	130	
Pyridine	110-86-1	-	120	
Pesticides				
4,4'-DDD	72-54-8	-	14	
4,4'-DDE	72-55-9	-	10	
4,4'-DDT	50-29-3	-	5.5	
Aldrin	309-00-2	-	0.2	
alpha-BHC	319-84-6	-	0.54	
alpha-Chlordane	5103-71-9	-	-	
beta-BHC	319-85-7	-	1.9	
Chlordane	57-74-9	2	2	
delta-BHC	319-86-8	-	-	
Dieldrin	60-57-1	-	0.21	
Endosulfan I	959-98-8	-	500	
Endosulfan II	33213-65-9	-	450	
Endosulfan sulfate	1031-07-8	-	120	
Endrin	72-20-8	2	2	
Endrin aldehyde	7421-93-4	-	-	
Endrin ketone	53494-70-5	-	-	
gamma-BHC (lindane)	58-89-9	0.2	0.2	
gamma-Chlordane	5103-74-2	-	-	
Heptachlor	76-44-8	0.4	0.4	
Heptachlor epoxide	1024-57-3	0.2	0.2	
Methoxychlor	72-43-5	40	40	
Toxaphene	8001-35-2	3	3	
Polychlorinated Biphenyls				
Aroclor-1016 (PCB-1016)	12674-11-2	-	1.7	
Aroclor-1221 (PCB-1221)	11104-28-2	-	1.7	

Table 1b

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**Groundwater Screening Levels
Corrective Action Framework
Marcus Hook Industrial Complex**

Analyte	CAS No.	US EPA ⁽¹⁾	PADEP Act 2 <2500 TDS, Used Aquifer
		Maximum Contaminant Levels (µg/L)	Non-Residential MCS2 (µg/L)
Polychlorinated Biphenyls (cont'd)			
Aroclor-1232 (PCB-1232)	11141-16-5	-	1.7
Aroclor-1242 (PCB-1242)	53469-21-9	-	1.7
Aroclor-1248 (PCB-1248)	12672-29-6	-	1.7
Aroclor-1254 (PCB-1254)	11097-69-1	-	1.7
Aroclor-1260 (PCB-1260)	11096-82-5	-	1.7
Total PCBs	1336-36-3	0.5	-
Inorganics			
Aluminum	7429-90-5	-	-
Antimony	7440-36-0	6	6
Arsenic	7440-38-2	10	10
Barium	7440-39-3	2000	2000
Beryllium	7440-41-7	4	4
Cadmium	7440-43-9	5	5
Calcium	7440-70-2	-	-
Chloride	16887-00-6	-	-
Chromium (total)	7440-47-3	100	100
Cobalt	7440-48-4	-	35
Copper	7440-50-8	1300	1000
Cyanide (total)	57-12-5	200	200
Fluoride	16984-48-8	-	4000
Iron	7439-89-6	-	-
Lead	7439-92-1	15	5
Magnesium	7439-95-4	-	-
Manganese	7439-96-5	-	300
Mercury	7439-97-6	2	2
Nickel	7440-02-0	-	100
Potassium	7440-09-7	-	-
Selenium	7782-49-2	50	50
Silver	7440-22-4	-	100
Sodium	7440-23-5	-	-
Sulfate	14808-79-8	-	-
Thallium	7440-28-0	2	2
Vanadium	7440-62-2	-	8.2
Zinc	7440-66-6	-	2000

Notes:

- = no screening level available

- (1) US EPA Maximum Contaminant Levels – EPA 816-F-09-004 May 2009.
https://www.epa.gov/sites/production/files/2016-06/documents/npwdr_complete_table.pdf
- (2) PA Act 2 Medium Specific Concentrations – August 27, 2016.
<http://www.dep.pa.gov/Business/Land/LandRecycling/Standards-Guidance-Procedures/Pages/Statewide-Health-Standards.aspx>
- (3) DRBC Surface Water Quality Standards – December 4, 2013 update - <http://www.state.nj.us/drbc/library/documents/WQregs.pdf>
The lowest of the human health (fish consumption) concentrations is selected as the DRBC criterion;
if no human health criterion, aquatic life criterion selected - as summarized on Table 1C.
- (4) MCL is for total of trihalomethanes.
- (5) Hardness dependent value; calculation based on average hardness in Middle Creek 2016.

Table 1c

Page 1 of 4

**Surface Water Screening Criteria
Corrective Action Framework
Marcus Hook Industrial Complex**

Analyte	Surface Water Criteria 1					
	Ecological Protection		Human Health Protection		DRBC Freshwater Objectives Systemic	DRBC Surface Water Screening Values
	CAS No.	Units	DRBC Freshwater Objectives Chronic (µg/L) - Table 5	Carcinogens Fish Ingestion Only (µg/L) - Table 6		
Volatile Organic Compounds						
1,1,1-Trichloroethane	71-55-6	µg/L	-	-	-	-
1,1,2-Tetrachloroethane	79-34-5	µg/L	-	4	-	4
1,1,2-Trichloroethane	79-00-5	µg/L	-	16	3600	16
1,1-Dichloroethane	75-34-3	µg/L	-	-	-	-
1,1-Dichloroethene	75-35-4	µg/L	-	-	7100	7100
1,2,3-Trichlorobenzene	87-61-6	µg/L	-	-	-	-
1,2,4-Trichlorobenzene	120-82-1	µg/L	-	-	70	70
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	µg/L	-	-	-	-
1,2-Dibromoethane (Ethylene dibromide)	106-93-4	µg/L	-	-	-	-
1,2-Dichlorobenzene	95-50-1	µg/L	-	-	1300	1300
1,2-Dichloroethane	107-06-2	µg/L	-	37	-	37
1,2-Dichloroethene (total)	540-59-0	µg/L	-	-	-	-
1,2-Dichloropropane	78-87-5	µg/L	-	15	-	15
1,3-Dichlorobenzene	541-73-1	µg/L	-	-	1300	1300
1,3-Dichloropropene	542-75-6	µg/L	-	-	63000	63000
1,4-Dichlorobenzene	106-46-7	µg/L	-	-	190	190
2-Butanone (Methyl ethyl ketone) (MEK)	78-93-3	µg/L	-	-	-	-
2-Chloroethyl vinyl ether	110-75-8	µg/L	-	-	-	-
2-Hexanone	591-78-6	µg/L	-	-	-	-
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	108-10-1	µg/L	-	-	-	-
Acetone	67-64-1	µg/L	-	-	-	-
Acrolein	107-02-8	µg/L	-	-	9.3	9.3
Acrylonitrile	107-13-1	µg/L	-	0.25	-	0.25
Benzene	71-43-2	µg/L	-	14	3100	14
Bromodichloromethane	75-27-4	µg/L	-	17	-	17
Bromoform	75-25-2	µg/L	-	140	9600	140
Bromomethane (Methyl bromide)	74-83-9	µg/L	-	-	1500	1500
Carbon disulfide	75-15-0	µg/L	-	-	-	-
Carbon tetrachloride	56-23-5	µg/L	-	1.6	150	1.6
Chlorobenzene	108-90-7	µg/L	-	-	1600	1600
Chlorobromomethane	74-97-5	µg/L	-	-	-	-
Chloroethane	75-00-3	µg/L	-	-	-	-
Chloroform (Trichloromethane)	67-66-3	µg/L	-	470	2100	470
Chloromethane (Methyl chloride)	74-87-3	µg/L	-	-	-	-
cis-1,2-Dichloroethene	156-59-2	µg/L	-	-	-	-
cis-1,3-Dichloropropene	542-75-6	µg/L	-	-	-	-
Cyclohexane	110-82-7	µg/L	-	-	-	-
Dibromochloromethane	124-48-1	µg/L	-	13	21000	13
Dichlorodifluoromethane (CFC-12)	75-71-8	µg/L	-	-	-	-
Ethylbenzene	100-41-4	µg/L	-	-	2100	2100
Isopropyl benzene	98-82-8	µg/L	-	-	-	-
m&p-Xylenes	-	µg/L	-	-	-	-
Methyl acetate	79-20-9	µg/L	-	-	-	-
Methyl cyclohexane	108-87-2	µg/L	-	-	-	-
Methyl tert butyl ether (MTBE)	1634-04-4	µg/L	-	-	-	-
Methylene chloride	75-09-2	µg/L	-	590	260000	590
o-Xylene	95-47-6	µg/L	-	-	-	-
Styrene	100-42-5	µg/L	-	-	-	-
Tetrachloroethene	127-18-4	µg/L	-	3.3	1300	3.3
Toluene	108-88-3	µg/L	-	-	15000	15000
trans-1,2-Dichloroethene	156-60-5	µg/L	-	-	10000	10000
trans-1,3-Dichloropropene	542-75-6	µg/L	-	-	-	-
Trichloroethene	79-01-6	µg/L	-	30	-	-
Trichlorofluoromethane (CFC-11)	75-69-4	µg/L	-	-	-	-

Table 1c

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**Surface Water Screening Criteria
Corrective Action Framework
Marcus Hook Industrial Complex**

Analyte	Surface Water Criteria 1					
	Ecological Protection		Human Health Protection		DRBC Freshwater Objectives Systemic	DRBC Surface Water Screening Values (µg/L)
	CAS No.	Units	DRBC Freshwater Objectives Chronic (µg/L) - Table 5	DRBC Freshwater Objectives Carcinogens Fish Ingestion Only (µg/L) - Table 6		
Volatile Organic Compounds (cont'd)						
Trifluorotrichloroethane (CFC-113)	76-13-1	µg/L	-	-	-	-
Vinyl chloride	75-01-4	µg/L	-	2.4	10000	2.4
Xylenes (total)	1330-20-7	µg/L	-	-	-	-
Semi-Volatile Organic Compounds						
1,2,3-Trichlorobenzene	87-61-6	µg/L	-	-	-	-
1,2,4,5-Tetrachlorobenzene	95-94-3	µg/L	-	-	1.1	1.1
1,2,4-Trichlorobenzene	120-82-1	µg/L	-	-	70	70
1,2,4-Trimethylbenzene	95-63-6	µg/L	-	-	-	-
1,2-Diphenylhydrazine	122-66-2	µg/L	-	0.2	-	0.2
1,3,5-Trimethylbenzene	108-67-8	µg/L	-	-	-	-
2,2'-Oxybis(1-chloropropane) (bis(2-Chloroisopropyl) ether)	108-60-1	µg/L	-	-	-	-
2,3,4,6-Tetrachlorophenol	58-90-2	µg/L	-	-	-	-
2,4,5-Trichlorophenol	95-95-4	µg/L	-	-	3600	3600
2,4,6-Trichlorophenol	88-06-2	µg/L	-	2.4	-	2.4
2,4-Dichlorophenol	120-83-2	µg/L	-	-	290	290
2,4-Dimethylphenol	105-67-9	µg/L	-	-	850	850
2,4-Dinitrophenol	51-28-5	µg/L	-	-	5300	5300
2,4-Dinitrotoluene	121-14-2	µg/L	-	3.4	2100	3.4
2,6-Dinitrotoluene	606-20-2	µg/L	-	-	-	-
2-Chloronaphthalene	91-58-7	µg/L	-	-	1600	1600
2-Chlorophenol	95-57-8	µg/L	-	-	150	150
2-Methylnaphthalene	91-57-6	µg/L	-	-	-	-
2-Methylphenol	95-48-7	µg/L	-	-	-	-
2-Nitroaniline	88-74-4	µg/L	-	-	-	-
2-Nitrophenol	88-75-5	µg/L	-	-	-	-
3,3'-Dichlorobenzidine	91-94-1	µg/L	-	0.028	-	0.028
3-Nitroaniline	99-09-2	µg/L	-	-	-	-
4,6-Dinitro-2-methylphenol	534-52-1	µg/L	-	-	280	280
4-Bromophenyl phenyl ether	101-55-3	µg/L	-	-	-	-
4-Chloro-3-methylphenol	59-50-7	µg/L	-	-	-	-
4-Chloroaniline	106-47-8	µg/L	-	-	-	-
4-Chlorophenyl phenyl ether	7005-72-3	µg/L	-	-	-	-
4-Methylphenol	106-44-5	µg/L	-	-	-	-
4-Nitroaniline	100-01-6	µg/L	-	-	-	-
4-Nitrophenol	100-02-7	µg/L	-	-	-	-
Acenaphthene	83-32-9	µg/L	-	-	990	990
Acenaphthylene	208-96-8	µg/L	-	-	-	-
Acetophenone	98-86-2	µg/L	-	-	-	-
Anthracene	120-12-7	µg/L	-	-	40000	40000
Atrazine	1912-24-9	µg/L	-	-	-	-
Benzaldehyde	100-52-7	µg/L	-	-	-	-
Benzidine	92-87-5	µg/L	-	0.0002	140	0.0002
Benzo(a)anthracene	56-55-3	µg/L	-	0.18	-	0.18
Benzo(a)pyrene	50-32-8	µg/L	-	0.018	-	0.018
Benzo(b)fluoranthene	205-99-2	µg/L	-	0.18	-	0.18
Benzo(g,h,i)perylene	191-24-2	µg/L	-	-	-	-
Benzo(k)fluoranthene	207-08-9	µg/L	-	1.8	-	1.8
Biphenyl (1,1-Biphenyl)	92-52-4	µg/L	-	-	-	-
bis(2-Chloroethoxy)methane	111-91-1	µg/L	-	-	-	-
bis(2-Chloroethyl)ether	111-44-4	µg/L	-	0.53	-	0.53
bis(2-Ethylhexyl)phthalate (DEHP)	117-81-7	µg/L	-	2.2	620	2.2
Butyl benzylphthalate (BBP)	85-68-7	µg/L	-	-	1900	1900
Caprolactam	105-60-2	µg/L	-	-	-	-

Table 1c

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**Surface Water Screening Criteria
Corrective Action Framework
Marcus Hook Industrial Complex**

Analyte	Surface Water Criteria 1					
	Ecological Protection		Human Health Protection		DRBC Freshwater Objectives Systemic	DRBC Surface Water Screening Values
	CAS No.	Units	DRBC Freshwater Objectives Chronic (µg/L) - Table 5	Carcinogens Fish Ingestion Only (µg/L) - Table 6		
Semi-Volatile Organic Compounds (cont'd)						
Carbazole	86-74-8	µg/L	-	-	-	-
Chrysene	218-01-9	µg/L	-	18	-	18
Dibenz(a,h)anthracene	53-70-3	µg/L	-	0.018	-	0.018
Dibenzofuran	132-64-9	µg/L	-	-	-	-
Diethyl phthalate	84-66-2	µg/L	-	-	44000	44000
Dimethyl phthalate	131-11-3	µg/L	-	-	1100000	1100000
Di-n-butylphthalate (DBP)	84-74-2	µg/L	-	-	4500	4500
Di-n-octyl phthalate (DnOP)	117-84-0	µg/L	-	-	-	-
Fluoranthene	206-44-0	µg/L	-	-	140	140
Fluorene	86-73-7	µg/L	-	-	5300	5300
Hexachlorobenzene	118-74-1	µg/L	-	0.00029	0.36	0.00029
Hexachlorobutadiene	87-68-3	µg/L	-	18	-	18
Hexachlorocyclopentadiene	77-47-4	µg/L	-	-	1100	-
Hexachloroethane	67-72-1	µg/L	-	3.3	46	3.3
Indeno(1,2,3-cd)pyrene	193-39-5	µg/L	-	0.18	-	0.18
Isophorone	78-59-1	µg/L	-	960	180000	960
Naphthalene	91-20-3	µg/L	-	-	-	-
Nitrobenzene	98-95-3	µg/L	-	-	690	690
N-Nitrosodiethylamine	55-18-5	µg/L	-	1.24	-	1.24
N-Nitrosodimethylamine	62-75-9	µg/L	-	3	-	3
N-Nitrosodi-n-butylamine	621-64-7	µg/L	-	14	-	14
N-Nitrosodi-n-propylamine	621-64-7	µg/L	-	0.51	-	0.51
N-Nitrosodiphenylamine	86-30-6	µg/L	-	6	-	6
N-Nitrosopyrrolidine	930-55-2	µg/L	-	34	-	34
Pentachlorobenzene	608-93-5	µg/L	-	-	1.5	1.5
Pentachlorophenol	87-86-5	µg/L	-	3	11000	3
Phenanthrene	85-01-8	µg/L	-	-	-	-
Phenol	108-95-2	µg/L	-	-	860000	860000
Pyrene	129-00-0	µg/L	-	-	4000	4000
Pesticides						
4,4'-DDD	72-54-8	µg/L	0.001	0.00031	0.037	0.00031
4,4'-DDE	72-55-9	µg/L	0.001	0.00022	0.037	0.00022
4,4'-DDT	50-29-3	µg/L	0.001	0.00022	0.037	0.00022
Aldrin	309-00-2	µg/L	-	0.00005	0.025	0.00005
alpha-BHC	319-84-6	µg/L	-	0.0049	-	0.0049
alpha-Chlordane	5103-71-9	µg/L	-	-	-	-
beta-BHC	319-85-7	µg/L	-	0.017	-	0.017
Chlordane	57-74-9	µg/L	0.0043	0.00081	0.14	0.00081
delta-BHC	319-86-8	µg/L	-	-	-	-
Dieldrin	60-57-1	µg/L	0.056	0.000054	0.043	0.000054
Endosulfan I	959-98-8	µg/L	-	-	-	-
Endosulfan II	33213-65-9	µg/L	-	-	89	89
Endosulfan sulfate	1031-07-8	µg/L	-	-	89	89
Endrin	72-20-8	µg/L	0.036	-	0.06	0.06
Endrin aldehyde	7421-93-4	µg/L	-	-	0.3	0.3
Endrin ketone	53494-70-5	µg/L	-	-	-	-
gamma-BHC (lindane)	58-89-9	µg/L	-	-	1.8	1.8
gamma-Chlordane	5103-74-2	µg/L	-	-	-	-
Heptachlor	76-44-8	µg/L	0.0038	0.000079	0.18	0.000079
Heptachlor epoxide	1024-57-3	µg/L	0.0038	0.000039	0.0046	0.000039
Methoxychlor	72-43-5	µg/L	-	-	-	-
Toxaphene	8001-35-2	µg/L	0.0002	0.00028	-	0.00028

Table 1c

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**Surface Water Screening Criteria
Corrective Action Framework
Marcus Hook Industrial Complex**

Analyte	Surface Water Criteria 1					
	Ecological Protection		Human Health Protection		DRBC Freshwater Objectives Systemic	DRBC Surface Water Screening Values (µg/L)
	CAS No.	Units	DRBC Freshwater Objectives Chronic (µg/L) - Table 5	Carcinogens Fish Ingestion Only (µg/L) - Table 6		
PCBs						
Aroclor-1016 (PCB-1016)	12674-11-2	µg/L	-	-	-	-
Aroclor-1221 (PCB-1221)	11104-28-2	µg/L	-	-	-	-
Aroclor-1232 (PCB-1232)	11141-16-5	µg/L	-	-	-	-
Aroclor-1242 (PCB-1242)	53469-21-9	µg/L	-	-	-	-
Aroclor-1248 (PCB-1248)	12672-29-6	µg/L	-	-	-	-
Aroclor-1254 (PCB-1254)	11097-69-1	µg/L	-	-	-	-
Aroclor-1260 (PCB-1260)	11096-82-5	µg/L	-	-	-	-
Aroclor-1262 (PCB-1262)	37324-23-5	µg/L	-	-	-	-
Aroclor-1268 (PCB-1268)	11100-14-4	µg/L	-	-	-	-
Total PCBs	1336-36-3	µg/L	0.014	0.000016	0.00849	0.000016
Inorganics						
Aluminum (dissolved)	7429-90-5	µg/L	87	-	-	87
Antimony (dissolved)	7440-36-0	µg/L	-	-	640	640
Arsenic (dissolved)	7440-38-2	µg/L	150	-	-	150
Barium (dissolved)	7440-39-3	µg/L	-	-	-	-
Beryllium (dissolved)	7440-41-7	µg/L	-	-	420	420
Cadmium (dissolved)	7440-43-9	µg/L	0.29443 (2)	-	16	16
Calcium (dissolved)	7440-70-2	µg/L	-	-	-	-
Chromium-total (dissolved)	16065-83-1	µg/L	-	-	750	750
Chromium-trivalent (dissolved)	-	µg/L	-	-	380000	380000
Cobalt (dissolved)	7440-48-4	µg/L	-	-	-	-
Copper (dissolved)	7440-50-8	µg/L	15.31605 (2)	-	-	15.31605 (2)
Cyanide (total)	57-12-5	µg/L	5.2	-	140	140
Iron (dissolved)	7439-89-6	µg/L	-	-	-	-
Lead (dissolved)	7439-92-1	µg/L	5.4	-	-	5.4
Magnesium (dissolved)	7439-95-4	µg/L	-	-	-	-
Manganese (dissolved)	7439-96-5	µg/L	-	-	-	-
Mercury (dissolved)	7439-97-6	µg/L	0.77	-	0.051	0.051
Nickel (dissolved)	7440-02-0	µg/L	79.32399 (2)	-	1700	1700
Potassium (dissolved)	7440-09-7	µg/L	-	-	-	-
Selenium (dissolved)	7782-49-2	µg/L	5	-	4200	4200
Silver (dissolved)	7440-22-4	µg/L	-	-	40000	40000
Sodium (dissolved)	7440-23-5	µg/L	-	-	-	-
Thallium (dissolved)	7440-28-0	µg/L	-	-	0.47	0.47
Vanadium (dissolved)	7440-62-2	µg/L	-	-	-	-
Zinc (dissolved)	7440-66-6	µg/L	204.78712 (2)	-	26000	26000

Notes:

- = no screening level available

(1) DRBC Surface Water Quality Standards – December 4, 2013 update - <http://www.state.nj.us/drbc/library/documents/WQreqs.pdf>

The lowest concentration human health criterion is selected as DRBC criterion; if no value is available from Table 6 or Table 7, then a corresponding value from Table 5 will be selected as DRBC criterion.

(2) Value is hardness dependent and calculated based on average hardness in Middle Creek in 2016.

Table 1d

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**Sediment Screening Levels
Corrective Action Framework
Marcus Hook Industrial Complex**

Analyte	CAS No.	Screening Criteria Freshwater Sediment EPA
Volatile Organic Compounds		
1,1,1-Trichloroethane	71-55-6	0.0302
1,1,2,2-Tetrachloroethane	79-34-5	1.36
1,1,2-Trichloroethane	79-00-5	1.24
1,1-Dichloroethene	75-35-4	0.031
1,3-Dichlorobenzene	541-73-1	4.43
1,4-Dichlorobenzene	106-46-7	0.599
2-Hexanone	591-78-6	0.1
Bromoform	75-25-2	0.654
Carbon disulfide	75-15-0	0.000851
Carbon tetrachloride	56-23-5	0.0642
Chlorobenzene	108-90-7	0.00842
Ethylbenzene	100-41-4	1.1
Isopropyl benzene	98-82-8	0.086
Styrene	100-42-5	0.559
Tetrachloroethene	127-18-4	0.468
trans-1,2-Dichloroethene	156-60-5	1.05
Trichloroethene	79-01-6	0.0969
1,2,3-Trichlorobenzene	87-61-6	0.858
1,2,4,5-Tetrachlorobenzene	95-94-3	1.09
1,2,4-Trichlorobenzene	120-82-1	2.1
1,2-Dichlorobenzene	95-50-1	0.0165
2,3,4,6-Tetrachlorophenol	58-90-2	0.284
2,4,6-Trichlorophenol	88-06-2	0.213
2,4-Dichlorophenol	120-83-2	0.117
2,4-Dimethylphenol	105-67-9	0.029
2,4-Dinitrotoluene	121-14-2	0.0416
2-Chlorophenol	95-57-8	0.0312
2-Methylnaphthalene	91-57-6	0.0202
3,3'-Dichlorobenzidine	91-94-1	0.127
4-Bromophenyl phenyl ether	101-55-3	1.23
4-Methylphenol	106-44-5	0.67
Semi-Volatile Organic Compounds		
Acenaphthene	83-32-9	0.0067
Acenaphthylene	208-96-8	0.0059
Anthracene	120-12-7	0.0572
Atrazine	1912-24-9	0.00662
Benzo(a)anthracene	56-55-3	0.108
Benzo(a)pyrene	50-32-8	0.15
Benzo(g,h,i)perylene	191-24-2	0.17
Benzo(k)fluoranthene	207-08-9	0.24
Biphenyl (1,1-Biphenyl)	92-52-4	1.22
bis(2-Ethylhexyl)phthalate (DEHP)	117-81-7	0.18
Butyl benzylphthalate (BBP)	85-68-7	10.9
Chrysene	218-01-9	0.166
Dibenz(a,h)anthracene	53-70-3	0.033
Dibenzofuran	132-64-9	0.415
Diethyl phthalate	84-66-2	0.603
Di-n-butylphthalate (DBP)	84-74-2	6.47

Table 1d

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**Sediment Screening Levels
Corrective Action Framework
Marcus Hook Industrial Complex**

Analyte	CAS No.	Screening Criteria Freshwater Sediment EPA
Semi-Volatile Organic Compounds (cont'd)		
Fluoranthene	206-44-0	0.423
Fluorene	86-73-7	0.0774
Hexachlorobenzene	118-74-1	0.02
Hexachloroethane	67-72-1	1.027
Indeno(1,2,3-cd)pyrene	193-39-5	0.017
Naphthalene	91-20-3	0.176
N-Nitrosodiphenylamine	86-30-6	2.68
Pentachloroethane	76-01-7	0.826
Pentachlorophenol	87-86-5	0.504
Phenanthrene	85-01-8	0.204
Phenol	108-95-2	0.42
Pyrene	129-00-0	0.195
Pesticides and PCBs		
4,4'-DDD	72-54-8	0.00488
4,4'-DDE	72-55-9	0.00316
4,4'-DDT	50-29-3	0.00416
Aldrin	309-00-2	0.002
alpha-BHC	319-84-6	0.006
beta-BHC	319-85-7	0.005
Chlordane	57-74-9	0.00324
delta-BHC	319-86-8	6.4
Dieldrin	60-57-1	0.0019
Endosulfan I	959-98-8	0.0029
Endosulfan II	33213-65-9	0.014
Endosulfan sulfate	1031-07-8	0.0054
Endrin	72-20-8	0.00222
gamma-BHC (lindane)	58-89-9	0.00237
Heptachlor	76-44-8	0.068
Heptachlor epoxide	1024-57-3	0.00247
Methoxychlor	72-43-5	0.0187
Toxaphene	8001-35-2	0.0001
PCBs, total	1336-36-3	0.0598
Inorganics		
Antimony	7440-36-0	2
Arsenic	7440-38-2	9.8
Cadmium	7440-43-9	0.99
Chromium	7440-47-3	43.4
Cobalt	7440-48-4	50
Copper	7440-50-8	31.6
Cyanide (total)	57-12-5	0.1
Iron	7439-89-6	20000
Lead	7439-92-1	35.8
Manganese	7439-96-5	460
Mercury	7439-97-6	0.18
Nickel	7440-02-0	22.7
Selenium	7782-49-2	2
Silver	7440-22-4	1.0
Zinc	7440-66-6	121

Table 1e

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**Indoor Air Screening Levels
Corrective Action Framework
Marcus Hook Industrial Complex**

Chemical	CASRN	EPA Industrial RSLs		PADEP Indoor Air		Occupational Exposure	
		Carc SL TR=1E-06 (µg/m³)	Noncarc SL THI=1 (µg/m³)	Carc SL TR=1E-06 Noncarc SL		OSHA PEL (µg/m³)	NIOSH REL (µg/m³)
				THI=1 (µg/m³)	Noncarc SL		
1,1,2-Trichloroethane	79-00-5	0.77	0.88	0.88	-	45000	45000
1,1-Dichloroethane	75-34-3	7.7	-	77	-	400000	400000
1,1-Dichloroethene	75-35-4	-	876	880	-	-	-
1,2,3-Trichlorobenzene	87-61-6	-	-	-	-	-	-
1,2,4-Trichlorobenzene	120-82-1	-	9	9	-	-	-
1,2,4-Trimethylbenzene	95-63-6	-	31	31	-	-	125000
1,2-Dibromo-3-chloropropane	96-12-8	-	0.88	0.02	-	-	-
1,2-Dibromoethane (Ethylene dibromide)	106-93-4	0.02	39	0.20	-	-	-
1,2-Dichlorobenzene	95-50-1	-	876	880	-	-	-
1,2-Dichloroethane	107-06-2	0.47	31	4.7	-	-	4000
1,2-Dichloropropane	78-87-5	1.2	18	12	350000	-	-
1,3,5-Trimethylbenzene	108-67-8	-	-	31	-	-	125000
1,3-Dichlorobenzene	541-73-1	-	-	-	-	-	-
1,4-Dichlorobenzene	106-46-7	1.1	3504	11	450000	-	-
2-Butanone (Methyl ethyl ketone) (MEK)	78-93-3	-	21900	22000	590000	590000	590000
2-Hexanone	591-78-6	-	131	130	410000	4000	-
2-Phenylbutane (sec-Butylbenzene)	135-98-8	-	-	-	-	-	-
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	108-10-1	-	13140	13000	410000	205000	-
Acetone	67-64-1	-	135780	140000	2400000	590000	-
Acrolein	107-02-8	-	0.09	0.09	250	250	-
Acrylonitrile	107-13-1	0.18	8.76	1.8	4100	2050	-
Benzene	71-43-2	1.6	131	16	-	-	-
Bromodichloromethane	75-27-4	0.33	-	3.3	-	-	-
Bromoform	75-25-2	11	-	110	5000	5000	-
Bromomethane (Methyl bromide)	74-83-9	-	22	22	-	-	-
Carbon disulfide	75-15-0	-	3066	3100	-	-	3000
Carbon tetrachloride	56-23-5	2.04	438	20	-	-	-
Chlorobenzene	108-90-7	-	219	220	350000	-	-
Chloroethane	75-00-3	-	43800	44000	2600000	-	-
Chloroform (Trichloromethane)	67-66-3	0.53	429	5.3	-	-	-
Chloromethane (Methyl chloride)	74-87-3	-	394	68	-	-	-
cis-1,2-Dichloroethene	156-59-2	-	-	-	-	-	-
Cyclohexane	110-82-7	-	26280	26000	1050000	1050000	-
Dibromochloromethane	124-48-1	-	-	4.5	-	-	-
Dichlorodifluoromethane (CFC-12)	75-71-8	-	438	440	4950000	4950000	-
Ethanol	64-17-5	-	-	-	1900000	1900000	-
Ethylbenzene	100-41-4	4.9	4380	49	435000	435000	-
Hexachlorobutadiene	87-68-3	0.56	-	-	-	-	240
Hexane	110-54-3	-	3066	3100	1800000	180000	-
Isopropyl benzene	98-82-8	-	1752	1800	245000	245000	-
Methyl acetate	108-87-2	-	-	-	610000	610000	-
Methyl tert butyl ether (MTBE)	1634-04-4	47	13140	470	-	-	-
Methylcyclohexane	95-63-6	-	-	-	2000000	1600000	-
Methylene chloride	75-09-2	1226	2628	2600	-	-	-
Naphthalene	91-20-3	0.36	13	3.6	50000	50000	-
Styrene	100-42-5	-	4380	4400	-	-	215000
tert-Butylbenzene	98-06-6	-	-	-	-	-	-
Tetrachloroethene	127-18-4	47	175	180	-	-	-
Toluene	108-88-3	-	21900	22000	-	-	375000
trans-1,2-Dichloroethene	156-60-5	-	-	260	-	-	-
Trichloroethene	79-01-6	2.99	9	9	-	-	-
Trichlorofluoromethane (CFC-11)	75-69-4	-	-	3100	5600000	-	-
Trifluorotrichloroethane (CFC-113)	76-13-1	-	131400	130000	7600000	7600000	-
Vinyl chloride	75-01-4	2.79	438	14	-	-	-
Xylenes (total)	1330-20-7	-	438	440	435000	-	-

Table 2a

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Soil Corrective Action Objectives
Corrective Action Framework
Marcus Hook Industrial Complex

Analyte	CAS No.	EPA Industrial RSLs ⁽¹⁾		PADEP Act 2 Medium Specific Concentrations	
		Carcinogenic TR=1E-04 (mg/kg)	Noncarcinogen ic SL THI=1 (mg/kg)	Non-Residential Direct Contact (0-2 ft) ⁽²⁾ (mg/kg)	Non-Residential Direct Contact (2-15ft) ⁽²⁾ (mg/kg)
Volatile Organic Compounds					
1,1,1-Trichloroethane	71-55-6	-	36000	10000	10000
1,1,2,2-Tetrachloroethane	79-34-5	270	23000	38	44
1,1,2-Trichloroethane	79-00-5	500	6.3	16	18
1,1-Dichloroethane	75-34-3	1600	230000	1400	1600
1,1-Dichloroethene	75-35-4	-	1000	10000	10000
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	6.4	25	0.37	0.43
1,2-Dibromoethane (Ethylene dibromide)	106-93-4	16	330	3.7	4.3
1,2-Dichlorobenzene	95-50-1	-	9300	10000	10000
1,2-Dichloroethane	107-06-2	200	140	86	98
1,2-Dichloroethene	540-59-0	-	-	-	-
1,2-Dichloropropane	78-87-5	440	66	220	260
1,3-Dichlorobenzene	541-73-1	-	-	10000	10000
1,3-Dichloropropene	542-75-6	820	-	560	640
1,4-Dichlorobenzene	106-46-7	1100	25000	200	230
1,4-Dioxane	123-91-1	2400	4500	290	330
2-Butanone (Methyl ethyl ketone) (MEK)	78-93-3	-	190000	10000	10000
2-Hexanone	591-78-6	-	1300	2400	2800
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	108-10-1	-	140000	10000	10000
Acetone	67-64-1	-	670000	10000	10000
Acrolen	107-02-8	-	0.6	1.6	1.8
Acrylonitrile	107-13-1	110	-	33	38
Benzene	71-43-2	510	420	290	330
Bromodichloromethane	75-27-4	130	23000	60	69
Bromoform	75-25-2	8600	23000	2000	2300
Bromomethane (Methyl bromide)	74-83-9	-	30	400	460
Carbon disulfide	75-15-0	-	3500	10000	10000
Carbon tetrachloride	56-23-5	290	570	370	430
Chlorobenzene	108-90-7	-	1300	4000	4600
Chlorobromomethane	74-97-5	-	630	3200	3600
Chloroethane	75-00-3	-	57000	10000	10000
Chloroform (Trichloromethane)	67-66-3	140	1000	97	110
Chloromethane (Methyl chloride)	74-87-3	-	460	1200	1400
cis-1,2-Dichloroethene	156-59-2	-	2300	6400	10000
Cyclohexane	110-82-7	-	27000	10000	10000
Dibromochloromethane	124-48-1	3900	23000	82	95
Dichlorodifluoromethane (CFC-12)	75-71-8	-	370	8000	9100
Ethylbenzene	100-41-4	2500	20000	890	10000
Isopropyl benzene	98-82-8	-	9900	10000	10000
m&p-Xylene	-	-	-	-	-
Methyl acetate	79-20-9	-	1200000	10000	10000
Methyl cyclohexane	108-87-2	-	-	-	-
Methyl tert butyl ether (MTBE)	1634-04-4	21000	64000	8600	9900
Methylene chloride	75-09-2	100000	3200	4700	5400
o-Xylene	95-47-6	-	2800	-	-
Styrene	100-42-5	-	35000	10000	10000
Tetrachloroethene	127-18-4	10000	390	3200	3600
Toluene	108-88-3	-	47000	10000	10000
trans-1,2-Dichloroethene	156-60-5	-	23000	4800	5500
Trichloroethene	79-01-6	600	19	160	180
Trichlorofluoromethane (CFC-11)	75-69-4	-	350000	10000	10000
Trifluorotrichloroethane (CFC-113)	76-13-1	-	170000	10000	10000
Vinyl chloride	75-01-4	170	370	61	280

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Soil Corrective Action Objectives
Corrective Action Framework
Marcus Hook Industrial Complex

Analyte	CAS No.	EPA Industrial RSLs ⁽¹⁾		PADEP Act 2 Medium Specific Concentrations	
		Carcinogenic TR=1E-04 (mg/kg)	Noncarcinogen ic SL THI=1 (mg/kg)	Non-Residential Direct Contact (0-2 ft) ⁽²⁾ (mg/kg)	Non-Residential Direct Contact (2-15ft) ⁽²⁾ (mg/kg)
Volatile Organic Compounds (cont'd)					
Xylenes (total)	1330-20-7	-	2500	8000	9100
Semivolatile Organic Compounds					
1,2,3-Trichlorobenzene	87-61-6	-	930	-	-
1,2,4,5-Tetrachlorobenzene	95-94-3	-	350	960	190000
1,2,4-Trichlorobenzene	120-82-1	11000	-	3100	10000
1,2-Diphenylhydrazine	122-66-2	290	-	110	190000
1,2,4-Trimethylbenzene	95-63-6	-	240	560	640
1,3,5-Trimethylbenzene	108-67-8	-	12000	10000	10000
2,2'-Oxybis(1-chloropropane) (bis(2-Chloroisopropyl) ether)	108-60-1	-	47000	220	250
2,3,4,6-Tetrachlorophenol	58-90-2	-	25000	96000	190000
2,4,5-Trichlorophenol	95-95-4	-	82000	190000	190000
2,4,6-Trichlorophenol	88-06-2	21000	820	3200	190000
2,4-Dichlorophenol	120-83-2	-	-	9600	190000
2,4-Dimethylphenol	105-67-9	-	16000	10000	10000
2,4-Dinitrophenol	51-28-5	-	1600	6400	190000
2,4-Dinitrotoluene	121-14-2	740	1600	290	190000
2,6-Dinitrotoluene	606-20-2	150	250	61	190000
2-Chloroethylvinyl ether	110-75-8	-	-	-	-
2-Chloronaphthalene	91-58-7	-	60000	190000	190000
2-Chlorophenol	95-57-8	-	5800	10000	10000
2-Methylnaphthalene	91-57-6	-	3000	13000	190000
2-Methylphenol	95-48-7	-	41000	160000	190000
2-Nitroaniline	88-74-4	-	8000	32000	190000
2-Nitrophenol	88-75-5	-	-	26000	190000
2-Phenylbutane (sec-Butylbenzene)	135-98-8	-	120000	10000	10000
3,3'-Dichlorobenzidine	91-94-1	510	-	200	190000
3-Nitroaniline	99-09-2	-	-	840	190000
4-Bromophenyl phenyl ether	101-55-3	-	-	-	-
4,6-Dinitro-2-methylphenol	534-52-1	-	66	260	190000
4-Chloro-3-methylphenol	59-50-7	-	82000	190000	190000
4-Chloroaniline	106-47-8	1100	3300	460	190000
4-Chlorophenyl phenyl ether	7005-72-3	-	-	-	-
4-Methylphenol	106-44-5	-	82000	16000	190000
4-Nitroaniline	100-01-6	11000	3300	4600	190000
4-Nitrophenol	100-02-7	-	-	26000	190000
Acenaphthene	83-32-9	-	45000	190000	190000
Acenaphthylene	208-96-8	-	-	190000	190000
Acetophenone	98-86-2	-	120000	10000	10000
Anthracene	120-12-7	-	230000	190000	190000
Atrazine	1912-24-9	1000	29000	400	190000
Benzaldehyde	100-52-7	82000	120000	-	-
Benzidine	92-87-5	1	-	0.4	190000
Benzo(a)anthracene	56-55-3	290	-	130	190000
Benzo(a)pyrene	50-32-8	29	-	12	190000
Benzo(b)fluoranthene	205-99-2	290	-	76	190000
Benzo(g,h,i)perylene	191-24-2	-	-	170000	190000
Benzo(k)fluoranthene	207-08-9	2900	-	76	190000
Biphenyl (1,1-Biphenyl)	92-52-4	41000	200	11000	190000
bis(2-Chloroethoxy)methane	111-91-1	-	2500	9600	10000
bis(2-Chloroethyl)ether	111-44-4	100	-	6.7	7.7
bis(2-Ethylhexyl)phthalate (DEHP)	117-81-7	16000	16000	6500	10000

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Soil Corrective Action Objectives
Corrective Action Framework
Marcus Hook Industrial Complex

Analyte	CAS No.	EPA Industrial RSLs ⁽¹⁾		PADEP Act 2 Medium Specific Concentrations	
		Carcinogenic TR=1E-04 (mg/kg)	Noncarcinogen ic SL THI=1 (mg/kg)	Non-Residential Direct Contact (0-2 ft) ⁽²⁾ (mg/kg)	Non-Residential Direct Contact (2-15ft) ⁽²⁾ (mg/kg)
Semivolatile Organic Compounds (cont'd)					
Butyl benzylphthalate (BBP)	85-68-7	120000	160000	10000	10000
Caprolactam	105-60-2	-	400000	-	-
Carbazole	86-74-8	-	-	4600	190000
Chrysene	218-01-9	29000	-	760	190000
Dibenz(a,h)anthracene	53-70-3	29	-	22	190000
Dibenzofuran	132-64-9	-	1000	3200	190000
Diethyl phthalate	84-66-2	-	660000	10000	10000
Dimethyl phthalate	131-11-3	-	-	-	-
Di-n-butylphthalate (DBP)	84-74-2	-	82000	10000	10000
Di-n-octyl phthalate (DnOP)	117-84-0	-	8200	10000	10000
Fluoranthene	206-44-0	-	30000	130000	190000
Fluorene	86-73-7	-	30000	130000	190000
Hexachlorobenzene	118-74-1	96	930	57	190000
Hexachlorobutadiene	87-68-3	530	1200	1200	10000
Hexachlorocyclopentadiene	77-47-4	-	7.5	10000	10000
Hexachloroethane	67-72-1	800	460	220	260
Indeno(1,2,3-cd)pyrene	193-39-5	290	-	76	190000
Isophorone	78-59-1	240000	160000	10000	10000
Naphthalene	91-20-3	1700	590	760	190000
Nitrobenzene	98-95-3	2200	1300	64000	10000
N-Nitrosodimethylamine	62-75-9	1.5	-	0.16	0.18
N-Nitrosodi-n-propylamine	621-64-7	33	-	13	10000
N-Nitrosodiphenylamine	86-30-6	47000	-	19000	190000
Pentachlorophenol	87-86-5	400	2800	230	190000
Phenanthrene	85-01-8	-	-	190000	190000
Phenol	108-95-2	-	250000	16000	18000
Pyrene	129-00-0	-	23000	96000	190000
Pesticides					
4,4'-DDD	72-54-8	960	-	380	190000
4,4'-DDE	72-55-9	930	-	270	190000
4,4'-DDT	50-29-3	850	520	270	190000
Aldrin	309-00-2	18	35	5.4	190000
alpha-BHC	319-84-6	36	6600	14	190000
alpha-Chlordane	5103-71-9	-	-	-	-
beta-BHC	319-85-7	130	-	51	190000
Chlordane	57-74-9	770	-	260	190000
delta-BHC	319-86-8	770	-	-	-
Dieldrin	60-57-1	14	41	6	190000
Endosulfan I	959-98-8	-	-	19000	190000
Endosulfan II	33213-65-9	-	-	19000	190000
Endosulfan sulfate	1031-07-8	-	-	19000	190000
Endrin	72-20-8	-	250	960	190000
Endrin aldehyde	7421-93-4	-	-	-	-
Endrin ketone	53494-70-5	-	-	-	-
gamma-BHC (lindane)	58-89-9	250	300	83	190000
gamma-Chlordane	5103-74-2	-	-	-	-
Heptachlor	76-44-8	63	580	20	190000
Heptachlor epoxide	1024-57-3	33	15	10	190000
Methoxychlor	72-43-5	-	4100	16000	190000
Toxaphene	8001-35-2	210	-	83	190000

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Soil Corrective Action Objectives
Corrective Action Framework
Marcus Hook Industrial Complex

Analyte	CAS No.	EPA Industrial RSLs ⁽¹⁾		PADEP Act 2 Medium Specific Concentrations	
		Carcinogenic TR=1E-04 (mg/kg)	Noncarcinogen ic SL THI=1 (mg/kg)	Non-Residential Direct Contact (0-2 ft) ⁽²⁾ (mg/kg)	Non-Residential Direct Contact (2-15ft) ⁽²⁾ (mg/kg)
Polychlorinated Biphenyls					
Aroclor-1016 (PCB-1016)	12674-11-2	2700	51	46	10000
Aroclor-1221 (PCB-1221)	11104-28-2	83	-	46	10000
Aroclor-1232 (PCB-1232)	11141-16-5	72	-	46	10000
Aroclor-1242 (PCB-1242)	53469-21-9	95	-	46	10000
Aroclor-1248 (PCB-1248)	12672-29-6	95	-	46	10000
Aroclor-1254 (PCB-1254)	11097-69-1	97	15	46	10000
Aroclor-1260 (PCB-1260)	11096-82-5	99	-	46	190000
Aroclor-1262 (PCB-1262)	37324-23-5	-	-	-	-
Aroclor-1268 (PCB-1268)	11100-14-4	-	-	40	10000
Total PCBs	1336-36-3	94	-	-	-
Inorganics					
Aluminum	7429-90-5	-	1100000	190000	190,000
Antimony	7440-36-0	-	470	1300	190,000
Arsenic	7440-38-2	300	480	61	190,000
Barium	7440-39-3	-	220000	190000	190,000
Beryllium	7440-41-7	690000	2300	11	190,000
Cadmium	7440-43-9	930000	980	6	190,000
Calcium	7440-70-2	-	-	-	-
Chromium ⁽³⁾	16065-83-1	-	-	190000	190,000
Cobalt	7440-48-4	190000	350	960	190,000
Copper	7440-50-8	-	47000	120000	190,000
Cyanide (total)	57-12-5	-	150	1900	190,000
Iron	7439-89-6	-	820000	190000	190,000
Lead ⁽⁴⁾	7439-92-1	-	2240	2240	190000/5995
Magnesium	7439-95-4	-	-	-	-
Manganese	7439-96-5	-	26000	150000	190,000
Mercury	7439-97-6	-	46	510	190,000
Potassium	7440-09-7	-	-	-	-
Nickel	7440-02-0	6400000	22000	64000	190,000
Selenium	7782-49-2	-	5800	16000	190,000
Silver	7440-22-4	-	5800	16000	190,000
Sodium	7440-23-5	-	-	-	-
Thallium ⁽⁵⁾	7440-28-0	-	12	32	190,000
Vanadium	7440-62-2	-	5800	220	190,000
Zinc	7440-66-6	-	350000	190000	190,000

Notes:

- = no criteria available

(1) US EPA Regional Screening Levels – May 2016 - <https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-may-2016>

(2) PA Act 2 Medium Specific Concentrations – August 27, 2016.

<http://www.dep.pa.gov/Business/Land/LandRecycling/Standards-Guidance-Procedures/Pages/Statewide-Health-Standards.aspx>

(3) Denotes value for trivalent chromium.

(4) Site specific values for 0-2 ft. interval based on default exposure criteria per agreement with PA DEP; subsurface soil value of 190,000 from PA Act 2; 5995 based on construction worker exposure and default criteria.

(5) No corrective action objective is calculated due to basis of thallium RSL.

(6) These values may be revised based on site specific risk assessments.

Table 2b

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Groundwater Corrective Action Objectives
Corrective Action Framework
Marcus Hook Industrial Complex

Analyte	CAS No.	Eastern Boundary ⁽¹⁾	Delaware River Boundary and Site Interior ⁽²⁾
		PADEP Act 2 <2500 TDS, Used Aquifer, Non-Residential MCS2 (µg/L)	CAO for Discharge to Delaware River
Volatile Organic Compounds			
1,1,1-Trichloroethane	71-55-6	200	-
1,1,2,2-Tetrachloroethane	79-34-5	4.3	40000
1,1,2-Trichloroethane	79-00-5	5	160000
1,1-Dichloroethane	75-34-3	160	-
1,1-Dichloroethene	75-35-4	7	71000000
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	0.2	-
1,2-Dibromoethane (Ethylene dibromide)	106-93-4	0.05	-
1,2-Dichlorobenzene	95-50-1	600	13000000
1,2-Dichloroethane	107-06-2	5	370000
1,2-Dichloroethene	540-59-0	-	-
1,2-Dichloropropane	78-87-5	5	150000
1,3-Dichlorobenzene	541-73-1	600	13000000
1,3-Dichloropropene	542-75-6	34	630000000
1,4-Dichlorobenzene	106-46-7	75	1900000
2-Butanone (Methyl ethyl ketone) (MEK)	78-93-3	4000	-
2-Hexanone	591-78-6	260	-
2-Phenylbutane (sec-Butylbenzene)	135-98-8	12000	-
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	108-10-1	9300	-
Acetone	67-64-1	110000	-
Acrolein	107-02-8	0.18	93000
Acrylonitrile	107-13-1	3.7	2500
Benzene	71-43-2	5	140000
Bromodichloromethane	75-27-4	80	170000
Bromoform	75-25-2	80	1400000
Bromomethane (Methyl bromide)	74-83-9	10	15000000
Carbon disulfide	75-15-0	6200	-
Carbon tetrachloride	56-23-5	5	16000
Chlorobenzene	108-90-7	100	16000000
Chloroethane	75-00-3	1200	-
Chloroform (Trichloromethane)	67-66-3	80	4700000
Chloromethane (Methyl chloride)	74-87-3	30	-
cis-1,2-Dichloroethene	156-59-2	70	-
cis-1,3-Dichloropropene	10061-01-5	-	-
Cyclohexane	110-82-7	53000	-
Dibromochloromethane	124-48-1	80	130000
Dichlorodifluoromethane (CFC-12)	75-71-8	1000	-
Ethylbenzene	100-41-4	700	21000000
Hexane	110-54-3	6200	-
Isopropyl benzene	98-82-8	3500	-
m&p-Xylene	-	-	-
Methanol	67-56-1	35000	-
Methyl acetate	79-20-9	120000	-
Methyl cyclohexane	108-87-2	-	-
Methyl tert butyl ether (MTBE)	1634-04-4	20	-
Methylene chloride	75-09-2	5	5900000
o-Xylene	95-47-6	-	-
Styrene	100-42-5	100	-
tert-Butylbenzene	98-06-6	12000	-
Tetrachloroethene	127-18-4	5	33000
Toluene	108-88-3	1000	150000000
trans-1,2-Dichloroethene	156-60-5	100	100000000
trans-1,3-Dichloropropene	10061-02-6	-	-

Table 2b

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Groundwater Corrective Action Objectives
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Analyte	CAS No.	Eastern Boundary ⁽¹⁾	Delaware River Boundary and Site Interior ⁽²⁾
		PADEP Act 2 <2500 TDS, Used Aquifer, Non-Residential MCS2 (µg/L)	CAO for Discharge to Delaware River
Volatile Organic Compounds (cont'd)			
Trichloroethene	79-01-6	5	300000
Trichlorofluoromethane (CFC-11)	75-69-4	2000	-
Trifluorotrichloroethane (CFC-113)	76-13-1	170000	-
Vinyl chloride	75-01-4	2	24000
Xylenes (total)	1330-20-7	10000	-
Semivolatile Organic Compounds			
1,2,4,5-Tetrachlorobenzene	95-94-3	35	-
1,2,4-Trichlorobenzene	120-82-1	70	700000
1,2,4-Trimethylbenzene	95-63-6	62	-
1,2-Diphenylhydrazine	122-66-7	4.3	2000
1,3,5-Trimethylbenzene	108-67-8	1200	-
2,2'-Oxybis(1-chloropropane) (bis(2-Chloroisopropyl) ether)	108-60-1	300	-
2,3,4,6-Tetrachlorophenol	58-90-2	3500	-
2,4,5-Trichlorophenol	95-95-4	12000	36000000
2,4,6-Trichlorophenol	88-06-2	120	24000
2,4-Dichlorophenol	120-83-2	20	2900000
2,4-Dimethylphenol	105-67-9	2300	8500000
2,4-Dinitrophenol	51-28-5	230	53000000
2,4-Dinitrotoluene	121-14-2	11	34000
2,6-Dinitrotoluene	606-20-2	2	-
2-Chloroethyl vinyl ether	110-75-8	-	-
2-Chloronaphthalene	91-58-7	9300	16000000
2-Chlorophenol	95-57-8	40	1500000
2-Methylnaphthalene	91-57-6	470	-
2-Methylphenol	95-48-7	5800	-
2-Nitroaniline	88-74-4	1200	-
2-Nitrophenol	88-75-5	930	-
3,3'-Dichlorobenzidine	91-94-1	7.6	280
3-Nitroaniline	99-09-2	-	-
4,6-Dinitro-2-methylphenol	534-52-1	9.3	2800000
4-Bromophenyl phenyl ether	101-55-3	-	-
4-Chloro-3-methylphenol	59-50-7	12000	-
4-Chloroaniline	106-47-8	17	-
4-Chlorophenyl phenyl ether	7005-72-3	-	-
4-Methylphenol	106-44-5	580	-
4-Nitroaniline	100-01-6	170	-
4-Nitrophenol	100-02-7	60	-
Acenaphthene	83-32-9	3800	9900000
Acenaphthylene	208-96-8	7000	-
Acetophenone	98-86-2	12000	-
Anthracene	120-12-7	66	400000000
Atrazine	1912-24-9	3	-
Benzaldehyde	100-52-7	-	-
Benzidine	92-87-5	0.015	-
Benzo(a)anthracene	56-55-3	4.9	1800
Benzo(a)pyrene	50-32-8	0.2	180
Benzo(b)fluoranthene	205-99-2	1.2	1800
Benzo(b)pyridine (Quinoline)	91-22-5	1.1	-
Benzo(g,h,i)perylene	191-24-2	0.26	-
Benzo(k)fluoranthene	207-08-9	0.55	18000
Biphenyl (1,1-Biphenyl)	92-52-4	430	-

Table 2b

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Groundwater Corrective Action Objectives
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Analyte	CAS No.	Eastern Boundary ⁽¹⁾	Delaware River Boundary and Site Interior ⁽²⁾
		PADEP Act 2 <2500 TDS, Used Aquifer, Non-Residential MCS2 (µg/L)	CAO for Discharge to Delaware River
Semivolatile Organic Compounds (cont'd)			
bis(2-Chloroethoxy)methane	111-91-1	350	-
bis(2-Chloroethyl)ether	111-44-4	0.76	5300
bis(2-Ethylhexyl)phthalate (DEHP)	117-81-7	6	22000
Butyl benzylphthalate (BBP)	85-68-7	1800	19000000
Caprolactam	105-60-2	-	-
Carbazole	86-74-8	170	-
Chrysene	218-01-9	1.9	180000
Dibenz(a,h)anthracene	53-70-3	0.6	180
Dibenzofuran	132-64-9	120	-
Diethyl phthalate	84-66-2	93000	440000000
Dimethyl phthalate	131-11-3	-	11000000000
Di-n-butylphthalate (DBP)	84-74-2	12000	45000000
Di-n-octyl phthalate (DnOP)	117-84-0	1200	-
Fluoranthene	206-44-0	260	1400000
Fluorene	86-73-7	1900	53000000
Hexachlorobenzene	118-74-1	1	2.9
Hexachlorobutadiene	87-68-3	44	180000
Hexachlorocyclopentadiene	77-47-4	50	11000000
Hexachloroethane	67-72-1	1	33000
Indeno(1,2,3-cd)pyrene	193-39-5	2.8	1800
Isophorone	78-59-1	100	9600000
Naphthalene	91-20-3	100	-
Nitrobenzene	98-95-3	230	6900000
N-Nitrosodimethylamine	62-75-9	0.018	30000
N-Nitrosodi-n-propylamine	621-64-7	0.49	140000
N-Nitrosodiphenylamine	86-30-6	690	60000
Pentachlorophenol	87-86-5	1	30000
Phenanthrene	85-01-8	1100	-
Phenol	108-95-2	2000	8600000000
Pyrene	129-00-0	130	40000000
Pyridine	110-86-1	120	-
Polychlorinated Biphenyls			
Aroclor-1016 (PCB-1016)	12674-11-2	1.7	-
Aroclor-1221 (PCB-1221)	11104-28-2	1.7	-
Aroclor-1232 (PCB-1232)	11141-16-5	1.7	-
Aroclor-1242 (PCB-1242)	53469-21-9	1.7	-
Aroclor-1248 (PCB-1248)	12672-29-6	1.7	-
Aroclor-1254 (PCB-1254)	11097-69-1	1.7	-
Aroclor-1260 (PCB-1260)	11096-82-5	1.7	-
Total PCBs	1336-36-3	-	0.16
Inorganics			
Aluminum	7429-90-5	200	870000
Antimony	7440-36-0	6	6400000
Arsenic	7440-38-2	10	1500000
Barium	7440-39-3	2000	-
Beryllium	7440-41-7	4	4200000
Cadmium	7440-43-9	5	160000
Calcium	7440-70-2	-	-
Chloride	16887-00-6	-	-
Chromium (total)	7440-47-3	100	7500000

Table 2b

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Groundwater Corrective Action Objectives
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Analyte	CAS No.	Eastern Boundary ⁽¹⁾	Delaware River Boundary and Site Interior ⁽²⁾
		PADEP Act 2 <2500 TDS, Used Aquifer, Non-Residential MCS2 (µg/L)	CAO for Discharge to Delaware River
Inorganics (cont'd)			
Cobalt	7440-48-4	35	-
Copper	7440-50-8	1000	153160
Cyanide (total)	57-12-5	200	1400000
Fluoride	16984-48-8	-	-
Iron	7439-89-6	-	-
Lead	7439-92-1	5	54000
Magnesium			
Manganese	7439-96-5	300	-
Mercury	7439-97-6	2	510
Nickel	7440-02-0	100	17000000
Potassium	7440-09-7	-	-
Selenium	7782-49-2	50	42000000
Silver	7440-22-4	100	400000000
Sodium	7440-23-5	-	-
Sulfate	14808-79-8	-	-
Thallium	7440-28-0	2	4700
Vanadium	7440-62-2	8.2	-
Zinc	7440-66-6	2000	260000000

Notes:

- no criteria available.

- (1) CAO for groundwater flowing to the east of the site in Pennsylvania, PA Act 2 Medium Specific Concentrations – August 27, 2016.
(2) CAO based on the lowest of the human health (fish consumption) concentrations from Tables 6 and 7 of DRBC is selected as the DRBC criterion; if no human health criterion, aquatic life criterion from Table 5 of DRBC is selected multiplied by a mixing factor for discharge into the Delaware River established by the CorMix model.

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